THE
ELECTRICAL REVIEW.

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ELECTRICAL REVIEW

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THE EXHIBITION—AND AFTER.

IT has become quite the conventional thing to appear, in print, to let a man's faults be buried along with his mortal remains. The same silence, or reticence, is not required of us when in the freeness of conversation we talk over his failings and balance them against his praiseworthy qualities and achievements, though there is always somebody present to cry "Hush! let the dead lie undisturbed."

We prefer to adopt the conventional attitude in regard to the Manchester Electrical Exhibition, which, after a long and full day, came to an end on Saturday night last. We shall, no doubt, for some time to come, talk between ourselves about various points concerning it, but some of them will not find their way into print, and that is just as well, for, after all, the principal thing to know is that there is an almost unanimous opinion among exhibitors and visitors qualified to judge, that the month's run was very successful in the stimulus that it gave to the electrical industry in the Lancashire district, and in the spirit of greater hopefulness and expectation that it has promoted among electrical men in all parts of the kingdom. It is hardly necessary to discuss here and now whether the measure of success would have been greater if this, that, or the other circumstance had been different—though it will be well to remember points of this description when another Exhibition scheme is put upon the table for our consideration. It is by experience that we learn in matters of this kind, and with our accumulated experience of the years 1905 and 1908, we ought to know how to run the next Exhibition with even greater success and fewer blemishes than have characterised either of the past shows.

The further instalment of opinions of exhibitors that we publish this week shows that good business has been done, and that exhibitors—speaking for the majority—are well satisfied with the results that have followed their expenditure of money and time, in spite of the inconvenience and annoyance that we suppose are inevitable corollaries of a decision to exhibit on a large scale away from one's usual district. But while some firms are exulting over business actually booked, others are hopeful in the expectation of trade that is pretty certain to follow the making of so many new friends and connections. The promoters, too, are also able to congratulate themselves upon the financial result, for the attendance and gate money have been far better than anybody ever anticipated they would be. There can be no doubt that the heartiness with which the Manchester Corporation and its Electricity Department devoted themselves to assisting in the popularising of the show was an important factor, but for which the result might have been very different. The part played by Mr. S. L. Pearce, the city electrical engineer, would take a lot of telling, and no terms of praise that we could give would be too high, either for his own services or those of his assistant, Mr. Wilkinson. To Councillor Kay, the

chairman of the Corporation Electricity Committee, and to Mr. McCowen, the city electrical engineer of Salford, our encomiums are also due, for they have devoted themselves unremittingly to manifold concerns coming within their own particular provinces. The Executive Committee, it almost goes without saying, have performed a most necessary function, for without them many things that have been would not have been, and some things that are not might have been. At various times and places they have met together, sometimes at much inconvenience to themselves, to settle a thousand and one things—sometimes fraught with considerable difficulty. The exhibitors themselves will not expect us to say much here concerning their own activity and enterprise in the matter—that we have alluded to already, and—they have their reward. Naturally enough, they are hoping for more, in the form of a share of the profits, in fulfilment of the promises announced in some of the early circulars published relating to the Exhibition. To Messrs. Northcote and Davenport, respectively the energetic manager and courteous secretary of the Exhibition, for their unfailing attentions in connection with the organisation and management of the affair from the beginning, praise is, of course, due; but they, like the exhibitors, also have their reward.

There is a side to the Exhibition that has not been referred to lately in these pages. During the earlier stages when the proposal was taking shape, there was some difficulty in regard to the fixing up of financial guarantees. We referred to it in our pages at the time. This was, after a while, overcome, making the scheme, with its own building, a possible success. Due credit ought in this connection to be accorded to the International Trading Exhibitions, Ltd., of London, and to Mr. H. L. Benjamin, of that company, in particular, for the support that they gave at a period when it was very necessary. The mere knowledge that they, too, will now have their reward, must not shut our eyes to the fact that it was their financial aid, as well as their ability in letting space to many engineering firms, that went a long way towards helping the Committee and exhibitors to secure so satisfactory an issue.

00!—or Much ado About Nothings.

The proceedings of an International Conference naturally differ from the proceedings of ordinary commonplace assemblies of rational beings; the Conference which ended its labours on Thursday last week, however, is unique, in that its proceedings differed materially from those of ordinary and—comparatively—commonplace conferences. This is, of course, as it should be. No one would wish that a Conference which only takes place once in 14 years or so should be marked by no distinctive feature.

The Conference which met at Paris in 1884 fixed the dimensions of the mercury standard intended to represent the ohm at 106 cm. × 1 mm². The standard was called the "legal ohm," but never came into general use. In 1892 the British Association promulgated standards of resistance, current, and pressure, adopting the value of 106·3 cm. for the length of the mercury resistance column, and substituting for the cross-sectional dimension that of mass—14·4521 gm. The electrochemical equivalent of silver was defined as 0·001118 gm., and an approximate value was given for the E.M.F. of the Clark cell. The Electrical Congress at Chicago in 1893 adopted the same values, and dubbed them "International"; but unfortunately all three definitions were independent of one another, and consequently, as none of them was perfectly correct (in spite of the six figures for the mass of mercury!), two values could be obtained for each standard—namely, the value specified for it, and the ratio of the values specified for the other two, these two values not being identical.

It is now known, as the result of more accurate determinations, that the length of the mercury column should be slightly diminished, *ceteris paribus*, to give the nearest approximation as yet possible to the true ohm—the unit, that is, based directly upon the absolute C.G.S. units. Further, the true electrochemical equivalent of silver is probably 0·0011182 to five places, and the E.M.F. of the Weston cell, which has been adopted in place of the Clark for a working standard, as derived from the two primary standards is 1·0182 volts if the higher value is taken for silver.

The great question before the Conference has been—Shall the international units be defined as closely as possible identical with the true C.G.S. units, or shall they have arbitrary values as hitherto? Round this question controversy has raged. Another important question—Whether the volt or the ampere should be adopted as the second of the two primary standards—was settled in favour of the ampere without much difficulty, though the American delegates made a stout fight for the standard cell. But the main question cropped up again and again. Great stress was laid on the importance of "continuity," though this was a somewhat nebulous entity. For practical purposes, of course, it is of no consequence whatever whether four, five, or six significant figures are employed; but it is desirable that the international standards should be as nearly identical with the true units as possible, and the addition of further significant figures would not affect the industrial world in the least, while it would certainly delay the necessity of another change in the definitions.

Eventually, as the president, Lord Rayleigh, remarked, the Conference adopted figures which it knew to be wrong, defining the values of the ohm and ampere standards to six figures, by simply adding two zeros after the fourth in each case. These zeros have no scientific meaning whatever; their effect appears to be similar to that of labels on reserved seats, which, in the meantime, are not to be occupied at all. We hesitate to question the wisdom of the Conference, which spent a large proportion of its time in arriving at this weighty conclusion; but we may, perhaps, quote the view of Dr. Stratton, of the Bureau of Standards, that the adoption of these zeros as the result of a day's deliberation was the great joke of the sitting. The same authority pointed out at the I.E.E. dinner, that by this decision those who did not want any change made could go back and report that no change had been made; while those who desired a change could report on their return that a change had been duly effected. Thus all parties would be satisfied! There may be others who think that the Conference in this connection presented to the world a singular spectacle—or, should we say, a pair of spectacles?

We have no sympathy with this figure-juggling; the Conference might very well have left the figures as they were—in effect it has done so, but only with a great show of doing something else. Otherwise, it should have adopted the nearest possible approximation to the true values, if only to five figures.

Its really good and genuine work has been the abolition of the third independent standard, which only led to sore confusion, and the establishment of a Permanent Commission to deal with electrical standards. It is recommended also that an International Laboratory shall be established to issue and compare standards, and this will be a valuable institution if it comes into existence.

Our Board of Trade standards, which have remained constant for 14 years to a remarkable degree of accuracy, are unaffected by the decisions of the Conference.

The B. of T. and London Electricity Supply.

The Board of Trade has issued a report to the House of Commons upon the London and District Electricity Supply Bill, in which its views upon certain points are set forth.

It appears that the Board is disposed in favour of giving more effective protection against competition to existing authorised distributors than is provided in Clause 53, which contains an instruction to the Board to take into account the capital outlay of the distributor and his financial position, when considering whether his consent is unreasonably withheld. The additional protection is sought for distributors who can show that they are exercising their powers with due regard to the interests of the public in respect of the supply of energy for power purposes. Seeing that it cannot be maintained that the public benefit by the supply of electricity at a price higher than is offered by the promoters of the new scheme, the inference seems to be that distributors who cannot compete in price with the bulk supply company must purchase energy from the latter for distribution, or submit to competition.

The Board demurs to the proposed extension of the purchase period from 42 to 52 years, and points out difficulties in the way of purchase at an earlier period, evidently based upon the unfortunate experience of the Marylebone Borough Council; to obviate a similar occurrence, it is proposed that the amount of compensation shall be the present value, at the time of purchase, of the annual profits for the unexpired period calculated upon the average profits for a period of five or seven years immediately preceding the purchase. It is suggested also that the L.C.C. should be given powers to purchase the undertaking at any time, on terms to be agreed with the company. These provisions are not calculated to facilitate the raising of capital by the company.

We are pleased to note that the Board suggests that if the L.C.C. acquires the undertaking, its administrative powers of control over works connected with the supply of electricity by other authorities in the London area should cease. It would obviously be intolerable for so formidable a competitor to have power to control, and therefore to hamper, the operations of rival undertakings.

Finally, as regards the transfer of the undertakings of other bodies to the company, the Board of Trade foresees the anomalous positions which may arise from the purchase and exercise of the powers, for example, of one of two competing concerns in a given area, resulting in ruinous competition with the remaining undertaking; moreover, after such a transfer, it would be impossible to say under which set of powers the company was working—its own Act or the transferred Provisional Order—and the powers of purchase by local authorities would fall into inextricable confusion. The Board of Trade has power to refuse such a transfer, but specifically objects to the responsibility of deciding such difficult questions, and argues that they ought to be referred to Parliament. The Board has accepted such plenary powers and onerous duties in connection with other matters—railways, for instance—that one might have thought this additional item of responsibility a mere trifle to it. But apparently there is a limit. It is high time, as we have said before, that we had a proper Department—a Ministry of Commerce—capable of assuming full responsibility for these and kindred matters, and relieving Parliament from the burden of detail inseparable from their consideration by that august assembly.

With regard to the other London Power Bills before Parliament, the Board of Trade through its President, Mr. Churchill, has secured an instruction to the Standing Committee to constitute the L.C.C. the purchasing authority in 1931, in place of the local authorities, and another intended to enable the municipal undertakings in the London area to link up their systems in the same way as the companies are doing.

MANCHESTER ELECTRICAL EXHIBITION.

The closing day of the Exhibition—Saturday last—was a very busy one, for not long after the doors were thrown open the public began to throng the gangways and interest themselves in the exhibits, which, taking full advantage of the last opportunity of showing what they could do, exhibitors had set running at an early hour. By the time the doors were closed on Saturday night, according to reports, 320,000 persons, exclusive of season-ticketholders, had passed the turnstiles during the 26 days—an average per day of over 12,000. The £2,500 worth of tickets purchased by the exhibitors for free distribution among the desirable public are, of course, included in the above total. In addition, there was, on the average, £90 per day taken in shillings at the turnstiles.

Cheap Tickets. The policy of selling tickets of admission in large numbers to exhibitors at threepence each may from some points of view be questionable. One exhibitor waxed furious over it on the morning of the last day. He employed language which once upon a time would have been called unparliamentary, but *nous avons changé tout cela*, and he condemned in no measured terms the management which could encourage the massing of the riff-raff of Manchester, as he termed it, in the narrow avenues of the building to the practical exclusion of people of the right sort who would have been willing to plank down their shilling, could they but have done the grand tour in comfort. The gate-money, he contended, would have been as great with a quarter the number of people at the higher price, and those interested from a business motive in closely examining the exhibits would have had the chance of seeing and criticising instead of being hustled from one end of the Exhibition to the other. We know an engineer and his friends who one evening were irresistibly carried along with the crowd, up one avenue and down another, without once being able to stop at a single stall, and then they took their departure glad enough to get out with no further annoyance than the crush. On the other hand, we know that many of these cheap tickets were made use of by foremen-mechanics, artisans, and other skilled workmen from many of the mills and factories in Manchester and its vicinity. We personally bought a batch which we know were used by the skilled employés of a cotton mill which is now being fitted with what is probably the largest electrical installation in the district. There are various considerations governing a matter of this nature, and it savours somewhat of selfishness to complain that Lancastrians and others who were not probable buyers should be debarred on the score of cheap admission from deriving amusement and pleasure, and, perhaps, from being educated to a higher perception of the things of this life. We are aware it was rumoured long ago that certain exhibitors or their assistants had sold these threepenny tickets to Tom, Dick and Harry, at a profit, but that cannot be laid at the doors of the management, whose intentions we are sure were all for the public benefit.

A Little Surprise. A friend introduced to us a new arrival from the Fatherland. After the usual salutation, we inquired of the untutored Teuton what he thought of the Exhibition brought together in England's industrial centre, from a scientific point of view, to which, as well as we can remember, he retorted: "Der fault I haf to find mid der English is dot id has not dot bersbikooity dot der Tcherman has. Now, for oxamble, in der English you say 'scientific.' Dot confeys no idea. In Tcherman ve haf der seemble vord *Wissenshaftlichen*, vich is melodious unt combrehensif. Id is der same mit your bapers. You haf a 'Real Estate Journal.' Dot is dree vords; in Tcherman ve say *Grundeigenthumszeitung*, in one. It is more flexible. In your theatres you haf a baper called der *Entr'acte*. Ve call such a baper *Theaterzwischenaktszeitung*. It is more peautiful! English is a veak langkvitch; und pesides, Tchermans speak id und write id beddher as der English." Taking, figuratively speaking, this slap on one cheek with the meekness which so well becomes us, we turned to him the other, and mildly ventured to ask, "What about the Kaiser!" *Verdammt*, *Donnerwetter*, *Zum Teufel*, *Zum Henker mit ihm*, shouted

the stranger as he fled from our presence, and we softly chortled, "God preserve the Emperor," with variations!

The Exhibitors' Dinner.

The exhibitors' dinner, which was held at the Midland Hotel on the evening of Thursday, 29th ult., with Mr. Councillor W. Kay in the chair, was quite a pleasant function, not so well attended, perhaps, as it might have been, but still fairly representative, some 140 sitting down to table. We believe the uncertainty which seemed to prevail amongst some of those in the Exhibition as to whether evening dress was *de rigueur* was the cause of a certain number of absentees who had not brought "claw hammers" and "clean biled rags" amongst their impedimenta. Unlike the Institution dinner of the previous Thursday, the toasts were confined to two—would that all diners-out were thus mercifully protected—that of Royalty, proposed by the chairman, and "The Electrical Exhibition Committee and Honorary Electrical Engineers."

To Mr. W. M. Musgrave, J.P., fell the honour of proposing the latter toast. The replies were entrusted to Mr. Kay, and to Mr. McCowen in the regretted absence, through illness, of the popular Manchester engineer, Mr. S. L. Pearce. Mr. Kay is evidently a strong man full of life and energy, and he praised unreservedly the Exhibition, the Committee, the consulting engineers, and everybody concerned in the inception, carrying out and completion of what had been the greatest success ever achieved in the old country. For his own share in this, Mr. Kay was modesty itself, but it is generally conceded that to him, and the Manchester Corporation, belongs the chief credit. Mr. McCowen bashfully deprecated the idea that he had done anything out of the way to merit special acknowledgment, and then came the post-prandial entertainment.

Mr. Pope, dubbed by a contemporary the Ecclesiastical representative, sang several topical songs with words by Mr. E. L. Hill; ballads were rendered by Messrs. Gibson and Abady; recitations by Messrs. Gibson and Warrilow, the latter giving in characteristic fashion "The Cricket Club of Red Nose Flat," with shooting-iron in hand and exploding caps; and Mr. A. R. Fenn gave a remarkably clever sleight-of-hand demonstration, concluding with imitation of wood-sawing, barn-door roosters, cackling hens, and the 'cello, choosing for this last effort that exquisite song, "I'll sing thee songs of Araby."

The exigencies of space will not allow us to print more than one of Mr. Pope's Exhibition songs, which were typed in a special souvenir edition of the Daily Programme, presented to those attending the dinner. We select the following which Mr. Pope gave in his most dramatic basso-profundo; later in the evening he treated us to a pathetic rendering of "Ohm Sweet Ohm," which brought tears to the eyes of many who were thinking longingly of the closing day:—

PARODY ON "THE I-RUSH JUBILEE."

Now a short time ago, boys, the Engineer of Manchester
Decided to electrify the County of Lancaster,
So he spoke to his Chairman and likewise to his Deputy
(Howarth and Kay, two splendid men 'twixt you and me)
Howarth and Kay were agreeable as they always are,
So Pearce got to work at once upon his scarlet motor-car,
Exhibitors he found at once, were not so easy to entice,
Though small firms were hot, the large ones were cold as ice.
But finally he got hold of Northcote and Davenport,
A happy combination of *savoir faire* and forethought,
Hard work, said they, naught shirk, but where the deuce do we come in;
The labourers are worth their hire so guarantee the blooming tin.
Pearce answered, "Money breeds money, the result will be
We'll make the show a huge success," Now gentlemen you'll all agree
What Manchester is showing now the world will buy, ere many days,
And if they haven't cash enough, they soon the blooming cash will raise.

Now, thanks to Pearce, to Northcote, to McCowen, and to Davenport,
We're selling stuff the whole day long, or, if we're not, we surely ought;
For there's A.C. and D.C. and things that no-one wants to see—
Six-phase and single-phase, two-phase and phases three;
Turbines and has-beens and quite a lot of might-have-beens;
Ozonisers, appetisers, rabbits on fluorescent screens;
Fire engines under steam and gas engines tucked away
All the bally lot of them in an outside alley-way;
Tall men like Simpson of Preston coming down to see
A scarlet-coated handsome gent. at least twelve inches more than he;
Arc lights, dark lights, horrid-looking vapour light;
Osramarcs and tantaphanes, illuminations every night;
Blue glasses, free passes, quite a lot of empty glasses;
Tea cups and claret cups, hiccups, also bottled Basses;
Ring frames and mule frames, gassing frames and doubling frames;
Advertising agents often qualified by other names;

We've castings and cast-offs, and scrap heaps and Eckstein Heap
Raphaels at 1d. each they're good but aren't they rather cheap?
Switchboards, repulsion motors, suction gas and CO_2,
Tramway meters, what-ho meters, meat safes and me and you.
Siemens and tea men, and I know two teetotal men;
Ceylon tea, Ferranti, and something else called "Just say when,"
Rifle ranges, toy railways, chocolate bars and G.E.C.
Welcome clubs, and other pubs, Coldstreams of more than tea;
Silent gears and staggered gears, and so-called silent—noisy gears.
Ten thousand voltage power lines with dividends all in arrears,
Contractors, detractors, but they're in the minority.
Consulting engineers, not one, they've all joined the majority.
Northcote, tail coat, big cigar and shiny hat,
Quite the impressario, got the talk and manner pat;
He's made our show a huge success, and as he's here before us,
Now join with me in right good will, and sing the good old chorus!

"FOR THE SAKE OF AULD LANG SYNE!"

More Opinions from Exhibitors.

The following are some further expressions of opinions concerning the success of the Exhibition, received by us from exhibitors:—

"*Batteries*," who had only a small exhibit, think that the Exhibition was a "fairly good one, although nothing like fully representative, a large number of firms not having exhibited." Would rather not express an opinion one way or the other regarding the effects of the show.

"*Instruments*" say Exhibition a success. Many inquiries received for their own special apparatus. The effect will probably be more obvious later on.

"*Conduits*" say that the success has, on the whole, exceeded their anticipations, especially in some lines. Brought many inquiries for two or three new things that were being shown. Inquiries and orders were chiefly from contractors, as the aforementioned new specialities appealed more particularly to them. As to the future effects, "It should help those who are suffering from the general trade depression, which, so far, however, does not seem to affect our class of business much."

"*Pump Makers, &c.*," say that the Exhibition has been a success. They have received orders and inquiries for steam pumps, air compressors, steam and speed recorders, and, in fact, for all their specialities. After effect should be good.

Manchester Corporation Electricity Department has secured new custom in all classes, covering lighting, power and heating supplies, and the after effect must be good.

"*Pottery*" say that generally the Exhibition has been more successful than they anticipated.

"*Instrument Makers*" consider that the success has been great, but the full effect can only be determined in course of time. They have received a large number of inquiries, both direct and at the Exhibition, and some have already matured into orders, while other orders are promised in the near future. The inquiries and orders were for almost every instrument and appliance exhibited, but especially for indicating and recording ammeters, voltmeters and watt-meters for C.C. and A.C., also test sets and laboratory standards. Good effect of the Exhibition should continue.

"*Destructors*" reply that the success was as great as anticipated, and it should continue. Inquiries were received for induced and forced-draught plants, and ventilating fans, Little's water-cooler and humidifier, and refuse destructors.

"*Pumps, &c.*" say that the success has been greater than was anticipated, and it will continue to benefit the trade. Orders and inquiries were received for steam and power pumps, and surfacing and boring machines.

"*Machine Tool Makers*" answer our first question in the affirmative. They received visits from a large number of customers in the Lancashire district, which cannot but do them good as exhibitors.

"*Switchgear*" display hesitation in answering (1), and add that the Exhibition would have been more successful

for all, if the gangways had been double the width. Inquiries were received from people actually interested in switchgear. Doubtful as to the after-effects of the Exhibition.

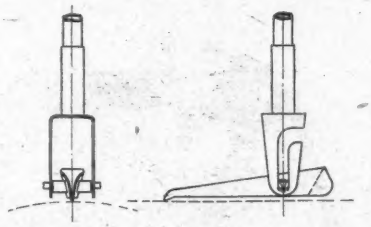
"*Switchgear, Meters, &c.*," report success. The Exhibition attracted a very great many people to Manchester who would not otherwise have visited them. Inquiries and orders were unimportant, owing to the fact that they were exclusively for the small details of their manufactures. After-effect must be good.

"*Dynamos and Motors*" reply that they are very pleased with the results, the Exhibition having been a greater success than they anticipated. They have received a very large number of inquiries, not only from visitors to their stand, but also, they say, "from firms who have evidently read accounts of our exhibits in the technical papers." Inquiries and orders for electrical machinery generally were received. They consider that the full effect will not be felt for some time after closing. "As soon as trade revives, no doubt those firms who have exhibited will derive considerable benefit from their exhibits."

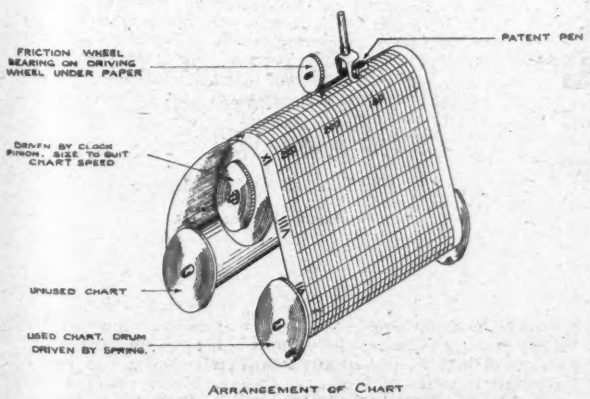
FURTHER NOTICES OF EXHIBITS.

Murday's Recorder.

Messrs. Evershed & Vignoles, Ltd., of Acton Lane Works, Chiswick, London, W., have sent us particulars of the Murday patent pen, which they were showing at Manchester, and which presents several novel features. Its inking mechanism is analogous to a drawing pen carried on knife-edges at the extremity of the index, with an axle perpendicular to the plane of motion (see figure). The chart, which is of the "continuous-roll" type, passes from one spool up over a driving wheel of special construction, and down to the receiving spool on which the record is wound. The pen works on



ARRANGEMENT OF PEN
TWICE FULL SIZE.


PATENT PEN
FRICTION WHEEL BEARING ON DRIVING WHEEL UNDER PAPER
DRIVEN BY CLOCK PINION, SIZE TO SUIT CHART SPEED
UNUSED CHART
USED CHART, DRUM DRIVEN BY SPRING.

ARRANGEMENT OF CHART
MURDAY RECORDER.

the horizontal surface of the paper formed at the summit of the driving wheel; and since its motion is in a straight line, and not an arc of a circle as usual, the time lines on the chart are also straight lines, and the record has thus rectangular co-ordinates.

The pen can be slipped out in a moment, cleaned instantly in the same manner as a drawing pen, and reinserted—the whole operation being completed in a few seconds. The friction on the paper is uniform and very small. The contact does not depend on the level of the instrument, and cannot be disturbed by vibration; and the record is thus perfectly uniform.

This movement is combined with an Evershed moving-coil indicating mechanism of specially robust character, the forces being made very large by a very powerful field and large moving coil. The whole mechanism is enclosed in a cast-iron case of strong construction, easily opened, yet watertight when closed. The usual glass window allows of the inspection both of the position of the index and of the past record. Simple means are provided for the removal of the record when required; and the operation of inserting new paper rolls is very easily effected. The whole design is characterised by strength and simplicity.

The shunts used with the instrument have only ·25 volt drop, and a new construction (due to Mr. Vignoles, who has applied for a patent) renders them very small for the load they carry.

A. W. Richardson.

Mr. A. W. Richardson, of Skew Bridge Works, Patricroft, near Manchester, had a stand in one of the side avenues, where a collection of enclosed and open-type arc lamps, together with accessories for workshop and general lighting, were on view. The lamps included were for from 2 to 150 amperes, and among them were special lamps for electric plant culture. The other exhibits, which indeed formed the major portion of the goods displayed, consisted of various types of direct-acting, high-pressure boiler-feed steam pumps, suitable for electric light station and other work, and varying from a small steam-car pump to one capable of feeding 1,000 H.P.

National Boiler Insurance Co.

In addition to numerous circulars and other literature, there were here attractively arranged a number of fusible plugs, and, in a show-case, a variety of other patent appliances for the use of steam-users and inspecting engineers.

Wilson's, Ltd.

Here and there in the Exhibition Hall were to be found exhibits which were placed there designedly to catch the interest of the ordinary householder. One of these, which we should say undoubtedly fulfilled that purpose, was the small stand of Messrs. Wilson's, Ltd, of St. James's Square, Manchester, where the "low vacuum" cleaner, for extracting dust from carpets, &c., by air suction, and worked by hand, was on show.

The electrical householder found a finer, and of course costlier, exhibit in the "Rotary" electric cleaner, which is operated by a tiny electric motor located in its lower quarters, and taking the necessary current from the house circuits by means of a lampholder and flex. We had the pleasure of witnessing a demonstration of the abilities of this very convenient and portable apparatus (it can easily be wheeled wherever it may be required) in the collection of dust from carpet and upholstery surfaces, curtains, &c., and were much impressed by it as an illustration of one of the manifold ways in which electricity is adapting itself as a labour-lessener for domestics, and as an annoyance saver for mistresses in the up-to-date household.

It is supplied with nozzles and cleaners for use according to the kind of service it has to perform, and with several pieces of tubing enabling any height or out-of-the-way corner to be "played upon."

Morton & Co.

This firm were catching the attention of the crowd easily by a varied collection of portable pocket electric lamps, and other small popular supplies of a like kind.

Standard Metal Engraving Co.

This exhibit consisted of a small office, on the walls of which were hung a number of framed show-cards, whereon were fixed a large number of metal name-plates for attaching to machinery and other manufactures.

Messrs. J. J. Griffin & Sons.

The "Jupiter" studio electric lamp was shown by this firm in a closed stand which served as a studio.

Price's Patent Candle Co.

This was an admirably arranged display of a full range of the firm's oils for electrical and textile machinery, gas and oil engines, &c., also a special soap for motorists and others who sometimes desire to remove grease and oil from their hands. We understand that a large amount of the machinery that was running in different parts of the Hall was lubricated with Price's oils.

Leecla Watch Co.

This company had a stand which proved popular with the public, showing a number of very moderate-priced "Leecla" keyless patent lever non-magnetic watches.

H. C. Slingsby.

Mr. H. C. Slingsby, of Old Street House, London, E.C., had a collection of his patent trucks, steel-back extension ladders, Reliance extension step ladders, also other manufactures, including armature trucks specially designed for electrical works.

R. Wood & Co.

This firm (of Bolton) showed, among other manufactures, their patent lubricator and force pump, which is their chief speciality.

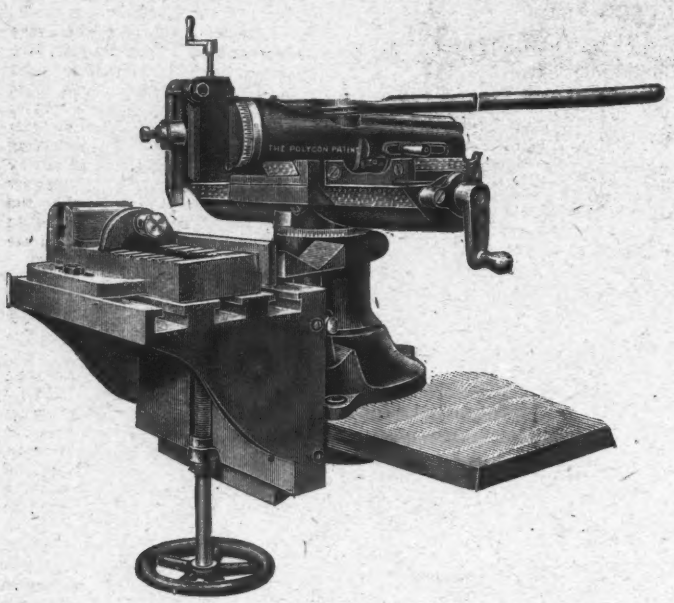
Thos. Robinson & Son, Ltd.

This Rochdale firm of wood-working engineers had a good display of motor-driven machinery, including hand-feed planing and surfacing machine, moulding machines, saw benches and band sawing machine, mortising machines, tenoning machine, &c.

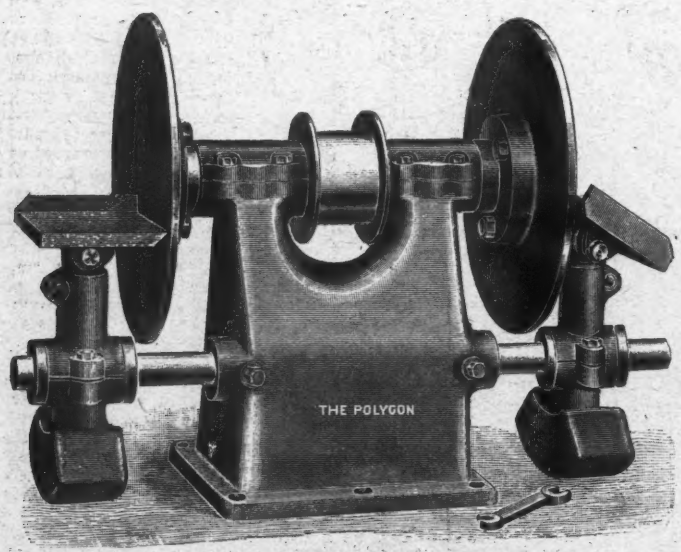
J. Bennett von der Heyde.

This Manchester firm were exhibiting some useful bench tools—viz., hand planer, shaper, emery-wheel grinder and disk grinder.

The planer and shaper are very similar in design, and are both operated by hand; each will take a cut in all metals ⅛ in. deep at any angle, and plane a surface 10 in. × 7½ in. with automatic feed. They are being used in many large engineering works for various purposes. They may be carried about to work where power is not available, the planer only weighing 90 lb. This method supersedes the slow and laborious method of finishing straight work by chisel and file; the devices are easily and rapidly worked, and are useful to instrument and model makers, and as time and money savers to large shops. Fixed on a bench, the fitter is saved the trouble of taking his small work to the power machines.



Shaper by Bennett von der Heyde.



Disk Grinder by Bennett von der Heyde.

The shaper, which we illustrate, has a greater capacity than the planer, having a rise and fall table; it is also fitted with two V-blocks and suitable clamps to fix a shaft for keyseating. The travelling slide has a turned shank attached underneath, which fits in a deep socket; this enables it to swivel round to any position and execute work at any angle. A table vice is also supplied with the machine, thus making a complete equipment for almost any small job.

The emery-wheel grinder is of the usual type, to carry two wheels, with large base that can either be screwed to bench or fitted to a pedestal and stand on the floor. The bearings are a good length, and the machine is of a design well suited to workshop use.

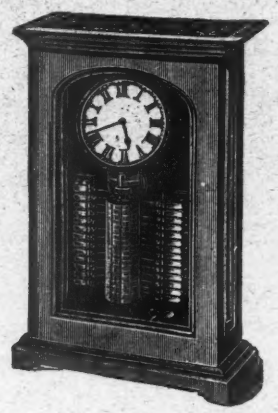
The disk grinder has become an almost indispensable tool in the engineering shop. It has two disks, and can be screwed to the bench, and placed amongst fitters, is useful for polishing their work. The rests attached to each disk have radial movement, and will cant to suit angular work.

The firm were also showing Duval's metallic packing, steam traps and steam dryers, cork coverings for steam pipes, &c.

Gent & Co.

This firm had some of their manufactures on one or two stands. For instance, the British Westinghouse Co. were showing their Parsons-Sloper secret intercom. telephones, which are claimed to afford absolute freedom from interruption and secrecy of conversation between any two points in the system, although only ordinary single-line wiring is adopted. Central battery intercommunication instruments of the "Regent" type, as adopted by the General Post Office, were also shown here.

On the stand of Messrs. E. M. Evans & Son also there was an exhibition of the B.P. patent electric impulse clocks. These instruments are claimed to be accurate timekeepers, while every clock in the system shows the same time. The current for operating the clocks is so small that a battery of Léclanche cells is sufficient for any size installation for nine to twelve months. The



Watchman's Tell-Tale Clock (Gent & Co.).

Parsons-Sloper Telephones.

Standard Pattern.

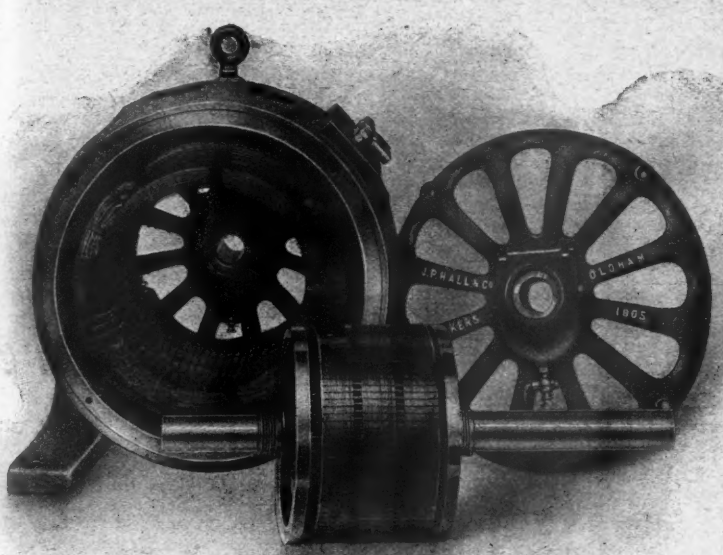
makers claim that there is no chance of a failure through lack of battery power, the timing of the clocks being independent of the strength of battery, and a warning bell giving ample notice when the battery is about to need replenishing. This system has been adopted for the Central Criminal Courts (Old Bailey), London, and the Mersey Dock and Harbour Board; also by the North-Eastern Railway for large turret clockwork. Other exhibits included Gent's dry ink marking tell-tale clocks for checking the movements of night watchmen, asylum attendants, &c., such as are in use in most of the asylums and many large works and warehouses throughout the country and in the Colonies.

W. J. Bates & Co., Ltd.

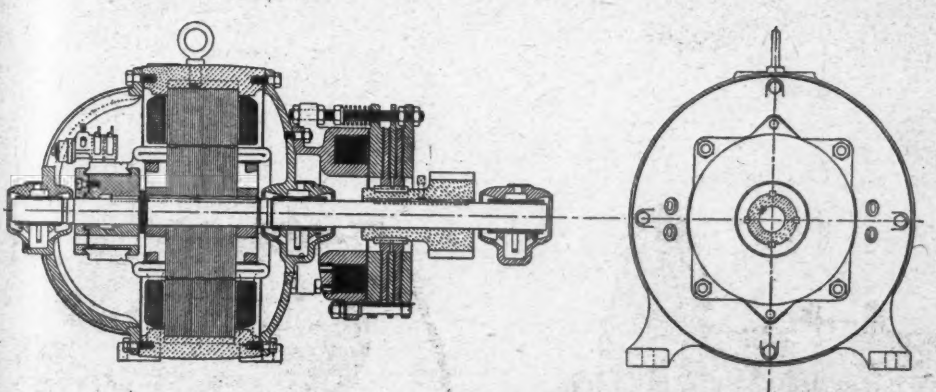
What proved to be a very live exhibit, and one that commanded considerable attention, was a new "1908 model" gas engine of 25 H.P., shown by Messrs. W. J. Bates & Co., of Manchester, who, we understand, are doing a very progressive business in this line. It was driving by belt, at a speed of 850 R.P.M., a compound dynamo. A 25-H.P. suction gas plant was also to be seen here.

J. P. Hall & Co., Ltd.

In our last issue we referred briefly to this firm's exhibit at the Exhibition, mentioning that on their stand were shown a number of motors ranging from 22 to 150 B.H.P. The series wound reversing motors on show were of substantial design and appearance, and we understand that Messrs. Hall make a speciality of these motors for crane, hoist, machine tools, shipyard machinery, &c. A 20-B.H.P. machine was equipped with their new type magnetic brake. These brakes are specially designed for use with the hoisting motors of electric cranes, and on shipyard bending rolls, and similar purposes where sudden stopping or reversing of direction of rotation is necessary. The brake will be understood by reference to the sectional view given; it is of the electro-magnetic type, the magnet coil being contained in a circular cast-iron box fitted to the back end plate of the motor. Several metal disks are mounted on a sleeve keyed to the motor shaft; the disks being secured to the sleeve by feather keys, so that they are free to move laterally. Between each pair of these revolving disks there is a stationary cast-iron plate loosely carried on four studs projecting from the motor end plates. The revolving and stationary disks are separated by fibre friction plates. The magnet coil is connected in series with the motor armature circuit, and when the current is cut off, the disks are pressed together by means of four spiral springs, so that the armature is unable to revolve. When the current is passing, the brake magnet is excited and attracts one of the stationary disks, and in so doing removes the pressure of the spring from the others so that the disks keyed to the armature shaft are free to revolve.



The Hall Standard Induction Motor, before Assembling.



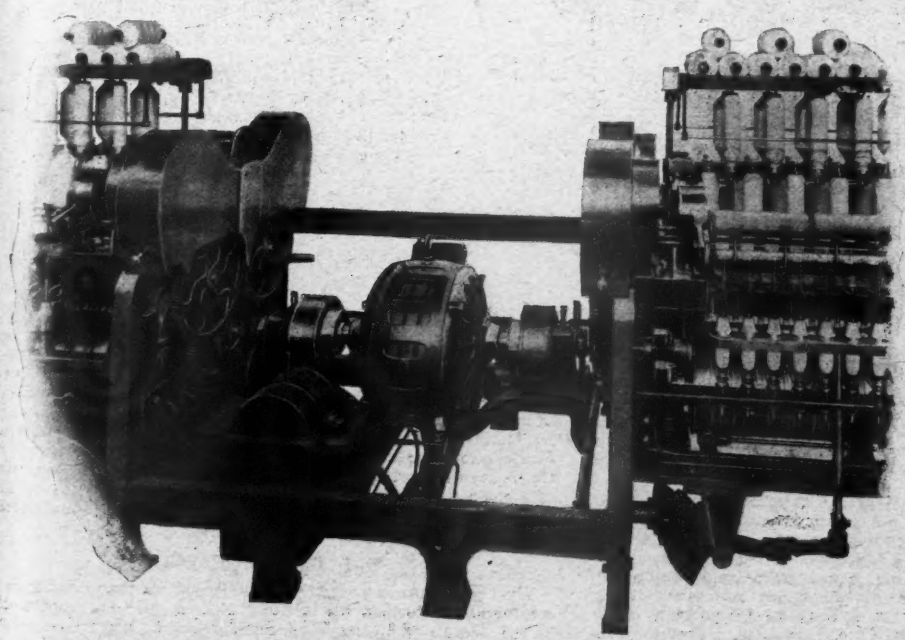
Hall Series-wound Reversing Motor, with Magnetic Brake Attached.

As mentioned previously, an attractive feature of their exhibit was two ring spinning frames driven by one of the firm's latest type three-phase induction motors, of 15 B.H.P. at 725 R.P.M. As shown in our view, the motor was placed between the two frames and coupled to them by two Hele-Shaw clutches. The motor is first started up separately, so that no great starting torque is demanded, and the frames are then gradually brought up to speed by means of a special hand-wheel and cam arrangement, to start each side slowly, and a lever to throw the clutch out of gear quickly. The ring spinning frames are of Messrs. Platt Bros.' manufacture, and are for spinning warp yarns.

Another view shows the parts of Messrs. Hall's standard pattern three-phase induction motor with squirrel-cage rotor, which we understand is being supplied in large numbers for driving various kinds of machinery.

The armature of a 300-KW. direct-current dynamo, which was exhibited, had a most substantial appearance, and the general design throughout clearly showed the sound engineering lines in construction.

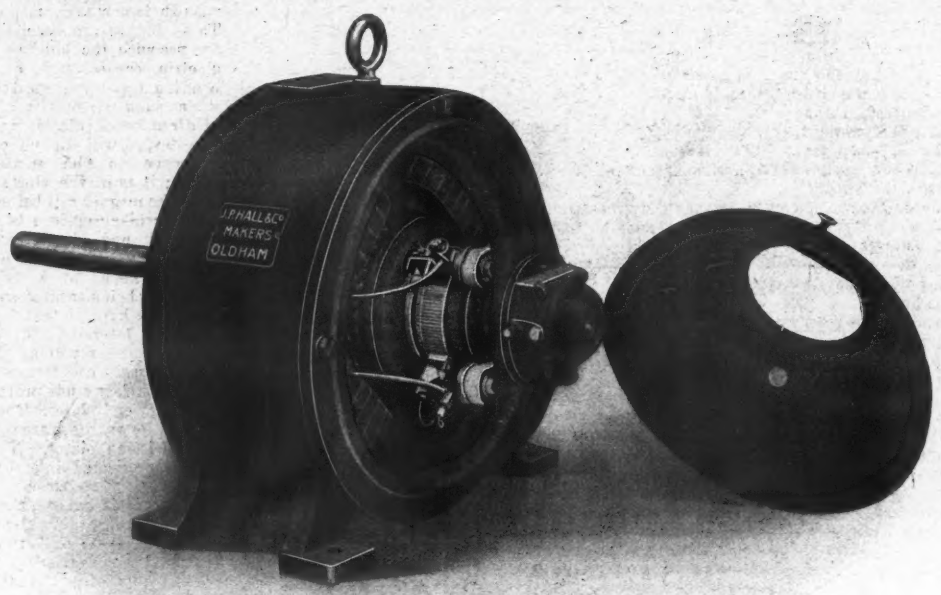
The "D A" type series-wound reversing motors shown, of 50, 30 and 22½ B.H.P., are very compact machines, with which the firm have attained considerable success. We also illustrate the motor with the end cover removed. This cover is fitted by means of bayonet socket fitting, very easily removed to gain access to the



15-B.H.P. Hall Induction Motor, Driving Two Ring Spinning Frames.

armature or brush gear. We understand that the firm have built over 3,000 of these motors, having an aggregate of over 34,000 B.H.P.

Messrs. J. P. Hall & Co. are contractors to the Admiralty, War Office, India Office, Crown Agent to the Colonies, G.P.O., and the principal British and Foreign Railway Companies. Their works, which have been specially built on modern lines, are situate close to Werneth station, and occupy over 144,000 sq. ft. of floor space.

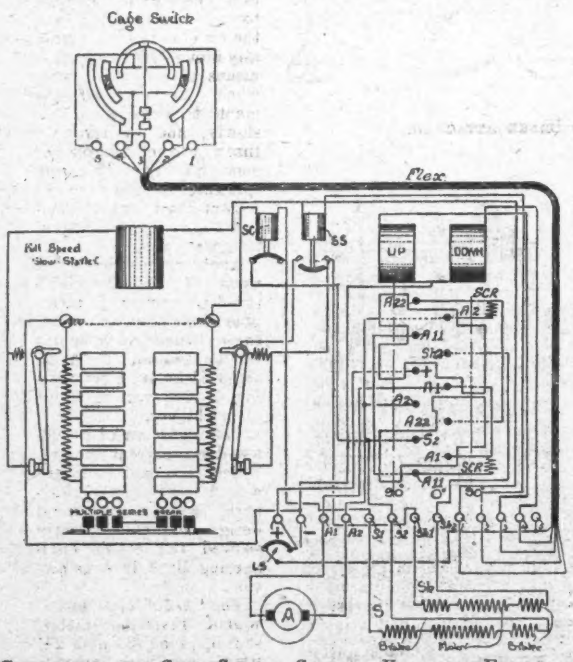


HALL TOTALLY ENCLOSED REVERSING CRANE MOTOR, WITH END-COVER REMOVED.

The Keighley Electrical Engineering Co., Ltd.

Engineers and others interested in electrical lifts were much attracted by the "Keighley" lift-gear, shown on stand No. 262 by MESSRS. JOHN COLLIER & Co., who hold the sole rights of sale for Lancashire districts.

The apparatus exhibited was precisely that which is used for operating a high-speed passenger lift, for which an interpole motor rated at 7½ B H.P. for intermittent use is employed. The normal speed of the motor on the maximum field excitation is 400 R.P.M., corresponding to a travel of the cage at the rate of 100 ft. per minute, and the maximum speed 800 R.P.M., equal to a cage travel of 200 ft. per minute. The motor and worm shafts have solid forged half-couplings on each; these are bolted together with the brake pulley inserted between, avoiding the use of keys. The brake blocks are pulled on to the brake pulley by powerful duplicate springs, and are released by means of ironclad electro-magnets, which are compound-wound in series with the compound field winding of the motor, and have only $\frac{1}{16}$ in. of an air-gap for the complete release of the brake.



CONNECTIONS FOR CAGE SWITCH CONTROL, KEIGHLEY ELECTRIC LIFT.

The system of control (Hindle's patent) may be adapted for either hand-rope, cage-switch, or push-button control, the arrangement exhibited being for switch in cage. The direction of travel is obtained by means of a controller of the tramway type, actuated by a double solenoid, the magnetic core of which is furnished with a rack, gearing into a pinion on the controller spindle, and rotating the same in either direction as desired, through an angle of about 90°. The circuit is actually closed, after the operation of the reverser, by a multiple-contact starting switch, also operated by a solenoid, which pulls the starter rapidly on to the first contact, the remaining portion of the travel being retarded by an air dash-pot. After the armature resistance is cut out (during which operation the field excitation of the motor is a maximum), the starter introduces a resistance in the motor shunt, increasing the speed to the desired amount. The starter itself is provided with six carbon brushes, so connected that there are three parallel paths available between the two series of hard-drawn copper contacts to which the starting resistance is connected.

The master switch in the cage is connected to the controller proper by a five-core flexible armoured cable, and is provided with three points or positions on each side of the "off" or central position. In starting, this switch may be turned over to the full-on position instantly; and the various operations described, the rotation of the reverser, the cutting-out of armature resistance, and the reduction of the motor field, follow in their proper sequence. When approaching a floor, however, the cage switch may be returned from the third to the second position, which has the effect of again building up the motor field and reducing the speed to one-half the maximum. Returning the cage switch to the first position permits the starting switch to return to zero, first reinserting the armature resistance in circuit, and opening the circuit at the carbon contacts before mentioned, which, at the moment of rupture, are arranged to give a multiple-series break, the arc being divided into six distinct portions of negligible amount. However, the method employed of reducing the speed of motor, and reinserting armature resistance before breaking the circuit, usually allows this to be done without visible arcing; it is only when the cage has to be moved a very short distance, and, in consequence, the starter brought on to the first contact and off again rapidly, that any visible evidence of the rupture of current appears, and this the multiple-series break adequately deals with.

At this point in the operation of stopping, with current cut off and the cage switch in the first position, the reversing controller is still on, and the motor may continue to run very slowly, merely by its own momentum, the connections being such that it excites its own field coils and brake magnets. The return of the cage switch to the off position induces a similar action on the part of the reverser, throwing a duplicate resistance across the armature terminals, which has the effect of absorbing the momentum of the armature itself and also of absorbing the remaining shunt excitation of the motor and brake coils. Practically all speed having been taken out of the armature by electrical means, wear and tear of the break blocks is avoided, as the latter are not applied until all motion practically ceases.

A diagram of the connections for cage-switch control is appended,

from which, in conjunction with the foregoing description, the flexibility of this system of control for lifts of all descriptions may be appreciated.

Messrs. Collier also showed a variety of plant and apparatus, and materials of interest in connection with installation work, electric lighting, heating and cooking, &c., these including a Crossley combined petrol engine and dynamo, battery, switchgear, &c., suitable for a small isolated installation.

International Winding Co.

This was an interesting exhibit to all interested in cable and wire covering and manufacture, the firm being specialists in the production of machinery for insulation winding, also magnet coil winding machines. The style 5-19 multiple and the "Multi-Multiple" machines were among those shown. A number of well-known cable makers and electrical manufacturers were named to us as users of the above machines.

Philipson & Co.

This Bolton firm had a stand in one corner of the Hall, where their electric tramcar lifeguards for both front and side use were on view, ready for demonstration as required. The car-end exhibited was fitted with their automatic rising step. The firm also showed their machine for cutting circular brushes, and their flat stripping brushes for use in textile works, as well as their motor non-skid.

Aerators, Ltd.

This firm exhibited a collection of finished castings, also "Prana" non-rusting plaited hose covering.

Brunner, Mond & Co., Ltd.

The stand of this firm consisted of a well-arranged display of muriate of ammonia, voltoids, zinc, cadmium, metal, salamac, &c.

A. Hirst & Son.

The "Crescent" electric coal-cutting machine was the feature of this firm's exhibit.

Dowsing Radiant Heat Co.

This firm's exhibit perhaps interested the general public more than the electrical engineering visitor, who is already pretty familiar with the Dowsing system of light and heat cure treatment, "Solarium" baths, electric radiators, &c.

Hacking & Co.

This Bury firm were exhibiting a 40-in. patent concave plaiting machine, driven by an Aston electric motor (½ H.P.). We understand that the firm is doing a good deal of work for textile factories that are electrifying.

Ripolin, Ltd.

This exhibit was a large and effective display of enamel paints for all purposes, including, of course, electric standards and machinery.

Pritchetts & Gold.

This firm's exhibit occupied part of the same stand as the Heatley-Gresham Engineering Co., and it consisted of some of their accumulators on two tiers.

Supplies, Ltd.

These radiators with their meter at foot were on view—the various designs have already been made quite familiar to the reader. We understand that all difficulty regarding obtaining the meters has been completely overcome.

R. O'Brien & Co.

This (electrical contracting firm had a display of many things, and one's difficulty was to make a selection of things that ought to be named. One interesting feature, however, was a board whereon one could judge for oneself the merits of the "E.M.F." Manufacturing Co.'s metal-filament lamp in comparison with other makes. A very small two-sided petrol engine lighting set on one bedplate, sufficing to light 8—16-C.P. 25-volt lamps running direct, such as is being put into shooting-boxes, &c., by the firm, was in evidence; also an electric geyzer, of which the trade will hear more later on.

Thomas Larmuth & Co., Ltd.

This firm (Salford) are specialists in machinery for the manufacture of electric wires and cables, and they showed a display of photographs illustrating wire-winding, stranding and covering machines, rubber and gutta-percha covering machines, braiding and lapping machinery, and other such manufactures which are already familiar to many of the leading wire and cable makers in this country who are using them.

W. H. Roy & Co.

This Manchester firm's speciality is, as many power station men already know, condensing and water-cooling plant. The exhibit consisted of models and illustrations of the construction and parts of their "Roy" patent cooling stack, water-cooling apparatus, exhaust steam oil separators, and exhaust head silencers.

Some conduits and fittings by Messrs. J. Birch and Sons were present on the stand occupied by Mr. D. C. Bate.

A show-case displaying a quantity of steel bars formed the exhibit of the Executors of Jas. Mills, Ltd.

A very effective exhibit, calculated to thoroughly interest every engineering visitor, as well as the Lancashire public, was the patent "Auto" stoker and automatic coal-elevator shown in operation by the Auto-Stoker Co., of Ashton-under-Lyne.

Wm. Mycock, of Manchester, was showing an electrically-driven whaleback sewing machine, also an electrical lamp printing appliance.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"FOUCAULT" writes:—"(1) Supposing that certain of a consumer's lamps are inadvertently connected so that current supplying them does not pass through the meter, can the supply company legally claim an estimated consumption, even if the period should run into years? (2) Can a supply company claim for units used, but not recorded, on account of slowness of the meter?"

*** He who undertakes to prove the incorrectness of a meter undertakes a difficult task, because the Legislature has decreed that, subject to a certain exception to be presently mentioned, the register of the meter shall be conclusive evidence, in the absence of fraud, of the value of the supply. The exception is that if any difference arises between any consumer and the undertakers as to whether any meter, whereby the value of the supply is ascertained (whether belonging to the consumer or to the undertakers), is or is not in proper order for correctly registering that value, or as to whether that value has been correctly registered in any case by any meter, that difference shall be determined, upon the application of either party, by an electric inspector to be appointed by the Board of Trade, and that inspector shall also decide by which of the parties the costs of and incidental to the proceedings before him shall be paid, and the decision of the inspector shall be final and binding on all parties.

The law is different in the cases of gas and electricity meters. In the case of gas, the register is only *prima facie* evidence; and where a new meter registered three times as much as a former meter had registered for five years during the corresponding quarter, Judge Rentoul, K.C., in the City of London Court, held on the facts that the register of the meter was not conclusive evidence.

In the circumstances, we do not think that, upon the facts suggested, the company could claim for arrears, but the point has never been definitely decided.

PROCEEDINGS OF INSTITUTIONS.

Tungsten Lamps.

THE last paper read before the Institution of Electrical Engineers in London, at the close of last session, was one by Mr. H. Hirst, on the subject of recent progress in tungsten metallic-filament lamps. The author commenced with a brief summary of the history of metallic-filaments, from the early attempts to make them of platinum, to the invention of the osmium lamp by Auer von Welsbach, by which the latter made amends for the blow he had inflicted upon the electrical industry by the invention of the incandescent mantle. Unfortunately the osmium lamp, while it had a high efficiency and long useful life, could not be made for pressures exceeding 77 volts. The tantalum lamp marked a further step in advance, though it was limited to 110 volts, and could not be used generally on A.C. circuits; but the introduction of tungsten rapidly followed, before the tantalum lamp had become firmly established.

Many years ago, Lodyguine had proposed to coat a core of platinum, silver or carbon with one of the highly refractory metals, but he failed to eliminate the core; tungsten could not be drawn into wire, owing to its want of ductility, but in 1904 Drs. Just and Hanaman patented a method of manufacturing pure tungsten filaments by incorporating the powdered metal into a paste with organic binding media, which were afterwards removed. The Deutsche Gasglühlicht Aktiengesellschaft (the Auer Co.) in the following year patented another process, and since then a large number of patents had been granted to these inventors for improvements in the processes of manufacture. The fundamental patents above mentioned, with a third granted to Drs. Just and Hanaman in 1905 for a "coating" process, said the author, appeared to protect the processes according to which tungsten filaments could be manufactured commercially at the time of writing. A number of other inventions, by Heany, Kuzel, the British Thomson-Houston Co., and Zerning, were also briefly outlined in the paper, but the author expressed the opinion that the Deutsche Gasglühlicht Aktiengesellschaft and the Just and Hanaman patents alone had during the last two years produced commercial and useful lamps.

The name adopted by the Auer Co. for the first commercial tungsten filament lamp was "Osram;" this filament was manufactured by preparing from the metals employed, in the most finely divided form, a paste with gum, dextrine, &c., of the consistency of putty, which was squirted through a fine orifice in a diamond, under a pressure of several tons per square inch. The

thread thus obtained was formed into filaments and heated, with the air excluded. The filaments could then be held in metal clamps and raised to a high temperature by the passage of an electric current, which caused the filaments to sinter, in the presence of gases which chemically attacked and removed all the constituents of the binding medium, leaving only the pure metal. Similar filaments could be made of osmium, but the Osram filament would stand a temperature at least 100° C. higher. In making an Osram filament for 120 volts, 22 to 27 C.P., with an efficiency of 1·1 watts per candle-power, a jet 0·055 mm. in diameter was employed, which shrank to 0·050 mm. when dried, and this was further reduced in the sintering process to 0·030 mm., the length being at the same time reduced. The heating process was controlled by the operator, with the aid of a voltmeter and an ammeter; the current increased rapidly at first, and then attained to a constant value. The filament so made was brittle, but could be bent into a loop of 1 cm. diameter without breaking, afterwards returning to its original form. The ends of the filament were attached to the leading-in wires by melting the ends of the latter with an electric arc into globules, which held the filament securely. The lamp was exhausted in the ordinary way, but the process took longer, on account of the slow escape of the gases occluded in the tungsten filament.

The Just-Wolfram lamp of Drs. Just and Hanaman was made on the "coating" process, ordinary carbon filaments of very small diameter (0·02 to 0·06 mm.) being heated in an atmosphere of volatile tungsten compounds and hydrogen; the latter reduced the metallic compounds, depositing the metal on the carbon filament. Next the filaments were heated in rarefied hydrogen to incandescence, when the carbon combined with the tungsten, forming a carbide, the filaments at this stage becoming tubular and presenting a glittering white metallic appearance. Lastly, the carbon was eliminated by heating the filaments in an atmosphere of hydrogen and a little steam. The filaments were fixed to the leading-in wires by means of a paste of tungsten powder, and tar or gum, which was heated to redness before heating the filament in the bulb. The filaments appeared like drawn wire, and remained tubular in section; otherwise, they were practically the same as those made by the paste process, and had the same characteristics. Such lamps would burn for 1,000 to 2,000 hours with a consumption of about 1 watt per candle, without any appreciable falling off in candle-power. Of all the metals tried, only tungsten gave this long life.

It had not been found commercially practicable to standardise metallic-filament lamps per candle-power.

Compared with carbon filaments, the Osram filament had a surface of 2 sq. mm. per Hefner C.P., or 1·8 sq. mm. per watt supplied, while the carbon filament had 5·5 sq. mm. per H.C.P., and 1·57 sq. mm. per watt.

Thus, the Osram filament radiated only 87 per cent. of the energy radiated by an equal surface of carbon, but gave 275 per cent. of the light given by the latter. It followed that the radiating power of the Osram filament was very different to that of carbon, and enabled it to be run at 1·1 watts per H.C.P. at a temperature about 250° C. above that of a carbon filament burning at 3·5 watts per H.C.P., that is, 100° C. lower than a carbon filament would have to be run to give the same efficiency. Further, the tungsten filament had a high positive temperature coefficient, and the light emitted by it varied only as the 3·6 power of the voltage, or the 2·3 power of the wattage, whereas the light of the carbon filament varied as the 6·3 power of the voltage, and the 3·0 power of the wattage. Thus, the former was much less affected by a change in the voltage.

High-voltage lamps of the Osram type were as good as the low-voltage lamps, but could not be produced for small candle-powers; 40 to 50 C.P. was the lowest obtained, and some extraordinary discovery would have to be made before that candle-power could be largely reduced. It would be necessary, therefore, for private houses and small spaces, to run lamps in series, and elaborate arrangements had been made at the Osram Works for testing lamps for this purpose; they were tested to ·01 ampere, and sorted out in five to seven series, the reference numbers (say, 28 to 38) on the caps giving the number of milliamperes consumed. On A.C. systems auto-transformers could be used.

Regarding the effect of metallic-filament lamps on supply systems, the author pointed to the experience of the gas companies with the Welsbach mantle, and expressed the opinion that the use of these lamps would bring about an increase of 100 per cent. in the unit adopted for electric lighting. Carbon lamps of 16 C.P. would be replaced by 25 to 35-watt tungsten lamps, while where a low illumination was required, carbon-filament lamps of 2½, 5 and 8 C.P. would be employed. Thus the new lamp would not decrease the current consumption of existing consumers to the extent anticipated, but would lead to a large increase in the amount of illumination, and the increased load from new consumers would more than make up for the decreased consumption of existing ones. This had been proved correct by Mr. C. P. Sparks, Mr. A. H. Seabrook and others.

The lamps could now be supplied to burn in any position. The increased cost of the lamps, as compared with carbon lamps, was soon wiped out by the saving in energy. Breakage in bulk had been a negligible quantity from the moment when it was understood how to pack the Osram lamps. As for blackening of the bulbs, if this occurred at all, it was usually at a very early period in the life of the lamp, and was generously dealt with by the makers. The data given below had been obtained from life tests by independent authorities.

Test No. I was made on an ordinary A.C. circuit, with a variation of voltage of about 3 per cent. Out of 12 lamps, 9 gave a life of 2,000 hours, with a 20 per cent. drop in candle-power, the first failure occurring at 900 hours. In the second test, 9 lamps were still good at 3,350 hours, when their average candle-power was 70 per cent. of the initial C.P.; it would be seen that it paid to run these lamps to the limit of life.

The tantalum lamp gave a much less favourable result, and the saving due to Osram lamps compared with the average English carbon lamp was 60 per cent. Figures for Osram lamps used for street lighting, supplied by Mr. C. A. Blascheck, Canterbury, showed an average life of about 1,800 hours, more than half of the lamps being still in use when these data were compiled.

Osram lamps had been standardised for 25-volt circuits at 10 and 16 H.C.P., taking about 10 and 16 watts respectively. Special transformers had been designed for use with these, the iron losses in which amounted to only 5 watts for an output of 300 watts. Examples were given in the paper, showing that with such a transformer, using 19 lamps of 16 C.P. as a maximum load in a house fitted with 25 lamps, the total saving of energy at 4d. per unit as compared with carbon lamps amounted to £6 4s. 9d. on a yearly bill of £9 10s. with carbon lamps, burning 500 hours per year—a saving of 65 per cent. Setting against this the cost of renewals, the saving was reduced to £4 6s. 7d. on a bill of £10 1s. 10d. for carbon lamps, or 43 per cent. The cost of the transformer would be about £2 2s.

Central-station engineers objected that the iron losses were so small that they would not keep the meter running, so that the cost of the iron losses was borne by the station; but the losses could be charged for, and the author suggested that the engineers should supply the transformers and charge the consumers at a slight increase per unit to cover the losses and the capital expenditure involved.

There was also a large field for these low-voltage lamps in connection with isolated installations, the cost of the generating plant being reduced very largely, as the maximum load would be diminished by about 3½ to 1, and the fire risks would be also reduced. A similar reduction in capital cost could be effected in designing plant for the many small towns and villages yet to be supplied with electrical energy.

The Progress of Electrical Design.

The opening meeting of the session of the Manchester Section of the Institution of Electrical Engineers was held on Friday evening, October 23rd, when Mr. Miles Walker delivered his inaugural address. The Chairman first referred to the prominent part played by Manchester in the history of electrical engineering, from the work of John Hopkinson (the father of scientific dynamo design) to the present enormous output of dynamos and motors, switchgear and cables from the district, which also possessed the largest municipal electricity supply station in

Life Test Results.

No. of test.	Type.	Cost per lamp.	Tested by	Starting. Watts.	Starting. C.P.	Efficiency in W./C.P.	No. of lamps.	Duration of test.	Average useful life.	Mean efficiency.	Average C.P.-hours.	Cost per 1,000 C.P.-hours. Renewals.	Energy at 4d. per unit.	Total.
	Low voltage.							Hours.	Hours.	W./C.P.		d.	d.	d.
I	Osram	48d.	Faraday House	35·7	36·3	0·99	12	2,000	1,520	1·12	48,700	0·98	4·48	5·46
II	Osram	48d.	Westminster Testing Laboratory	35·8	29·7	1·22	12	1,500	1,360	1·29	36,600	1·31	5·16	6·47
IIA*	Osram	48d.	Westminster Testing Laboratory	35·8	29·7	1·22	12	3,350	2,850	1·42	70,800	0·67	5·68	6·35
III	Osram	48d.	T. R. Charlottenburg	34·7	1·0	1·12	?	1,000	1,000	1·11	31,100	1·54	4·44	5·98
IV	Osram	48d.	Robertson E.L., Ltd.	35·0	27·7	1·26	6	1,800	1,720	1·36	45,600	1·06	5·4	6·50
V	Wolfram	48d.	Robertson E.L., Ltd.	38·0	30·7	1·24	2	1,000	1,000	1·27	28 900	1·66	5·08	6·74
VI	Tantalum	33l.	Westminster T. L.	39·1	22·0	1·78	6	1,000	700	1·84	15,000	2·19	7·36	9·55
VII	Carbon	12d.	——	59 0	18 7	3·15	10	1,000	1,000	3·25	18,000	0·67	13·00	13·67
	High Voltage.													
VIII	Wolfram	90d.	Robertson E.L., Ltd.	63·4	53 7	1·18	10	880	720	1·12	42,500	2·12	4·48	6·60
IX	Carbon	12d.	——	68·0	18 9	3·6	10	1,000	1,000	3·95	18,200	0·66	15·80	16·46

Note.—For the purpose of comparison, *all* the above results have been expressed in terms of the "Hefner" unit of candle-power.

* This is a continuation of Test II to 3,350 hours to show that it pays to burn Osram lamps to the limit of life.

this country, and supplied energy at a steadily decreasing price. The matter of cheap supply was of vital importance to electrical engineers; the price had been brought to a critical point, and if it were reduced but a little more, a vast field of supply would be opened. The average cost per unit generated for lighting and power for the whole kingdom last year was as high as 1·14d. per unit; but this included many small stations working under difficulties, and the cost in large modern stations with cheap coal supply was much lower; it had been falling for the last five years, and was still falling. In London the cost of bulk supply was estimated at ·28d.; they might take ·35d. for Manchester as a possible future cost, with a load factor of 30 per cent. The allowance for interest and sinking fund had fallen as low as ·55d. per unit, but still made a large addition to the cost; fortunately the capital cost of extensions was very low, so that they had in sight very low prices for electric power.

Taking an all-round figure of 3½ per cent. for depreciation, and 4 per cent. for interest, it was found for the whole country that the capital charge amounted to 1·45d. per unit, so that even if the works cost were reduced to ·25d. the companies could not charge a less average price than 1½d. per unit. Thus, where competition was possible, a new company with small capital could undersell an old one.

Progress in design had helped to make a little capital go a long way. The steam turbine, improvements in electrical machinery and materials, improvements in cables and in the lay-out of plant, and the marshalling of consumers so as to keep up the load factor, had all tended to economy. The capital cost of some power schemes in the past had been £120 per KW. installed; the average was over £75, but in the near future complete systems would be equipped at a total cost between £20 and £35 per KW., and the generating station might cost as low as £12 per KW. For example, on the basis of the recent extensions carried out at Manchester by Mr. Pearce, the generating machinery and foundations could be put in for £3 75; boilers, conveyors and piping, for £2 25; switchgear for £0·55; and allowing £5·5 for land, buildings and accessories, the total came to £12·05 per KW. for the station.

The price of machinery had been rapidly falling, and the quality improving. Lantern views were shown, illustrating the great advances that had been made in a few years, in various classes of electrical machinery, the output having been increased by 40 or 50 per cent. for the same dimensions, while the efficiency and other characteristics had been materially improved. A turbo-alternator frame, which in 1904 gave 1,250 K.V.A. as a two-pole 25-cycle generator, now gave 1,850 K.V.A. as a four-pole 50-cycle generator, at 1,500 R.P.M.; but a 1,850-K.V.A. 50-cycle generator, running at 3,000 R.P.M., was now built of one-third the weight of the former, and with an efficiency 2 per cent. higher. Illustrations of modern stations were also contrasted with those of stations equipped 10 years ago, showing the enormous changes which had taken place in the interim. Sub-station plant had similarly changed in character and efficiency.

The D.C. turbo-generator had likewise advanced, and was now as stable as the old engine-type. A 1,000-KW. 500-volt D.C. turbo-generator with radial commutator was shown.

Future improvements might take the direction of reducing the heat generated in machines, or making better provision for carrying it away, the former being preferable. Improvements in the quality of the iron used, and in the methods of working it, had greatly reduced the iron losses, particularly in transformers, enabling the weight to be reduced one-half, and further advances might be made in this direction. Experimental research with this object ought to be carried out by some official technical institution. Heat losses through eddy currents in copper conductors had been reduced in recent machines, and air friction might also be lessened in high-speed machines.

Various methods of carrying away heat had been adopted, and there was much scope for further improvement in this matter, as well as in the heat-conducting qualities of insulating materials. A thoroughly satisfactory insulator would do more than anything else to cheapen electricity supply, and to increase the reliability of electrical plant, a feature of the first importance.

A hearty vote of thanks was accorded to the Chairman for his address. A smoking concert followed, which was attended by a large number of members and friends.

Institution of Civil Engineers.

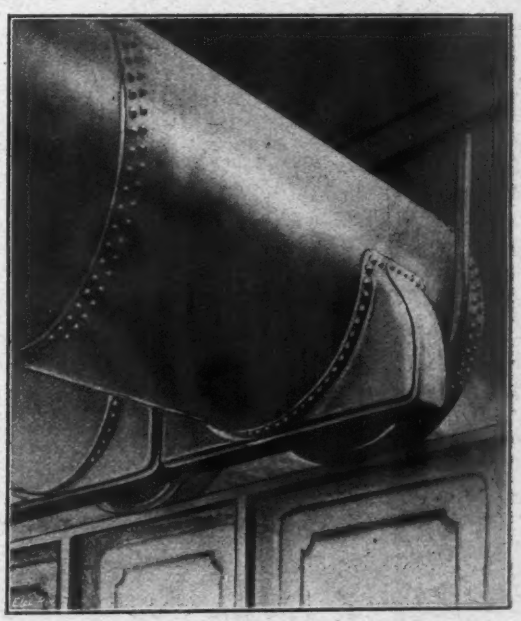
In his inaugural address on Tuesday last, the President, Mr. J. C. Inglis, dealt mainly with questions relating to transport, the fundamental importance of which to all classes he emphasised. He eulogised the work of Brunel, pointing out that much of it was to-day substantially unaltered and highly efficient, while, in his preference for the broad gauge, he showed remarkable foresight. Regarding the question of competition in railway working, the President deprecated the policy of encouraging competition, which must tend to depreciate the financial status and efficient performance of such undertakings. Labour conditions were also of prime importance. Any attempt to raise artificially the remuneration of labour must retard the ultimate adjustment of the relations between capital and labour. Frequency of travel had an important bearing upon the volume of traffic in a given district, as was shown by instances quoted by the President, in which an enormous increase had occurred in three years. Accuracy of gauge, he said, was the predominating factor in the avoidance of oscillation on railways. The burden of regulations imposed by the Government upon British railways was mentioned as a very important factor in the high cost of construction; the Light Railways Act was passed in order to cheapen and facilitate the provision of means of transport in agricultural districts, but had proved a failure, as only about 20 *bonâ fide* light railways had been built out of 130 orders granted in 10 years since the passing of the Act. The development of road motor traction sometimes paved the way to the provision of light railways, and might prove an important factor in this respect.

The work done by the Engineering Standards Committee, the provision of a new home for the Institution, and the increase in the efficiency of the Institution, were also dealt with by the President.

NEW WATER-TUBE BOILERS.

We recently had the pleasure of visiting one of the largest boiler manufacturing works in this country, which has an output of about one boiler per day throughout the year. Hitherto, the bulk of these boilers have been of the shell type, of various descriptions, but the firm have also manufactured water-tube boilers of several designs for some time past, and are now arranging, in alliance with the Water-Tube Boiler and Engineering Co., of 11, Queen Victoria Street, E.C., to produce horizontal water-tube boilers of the general type shown in the accompanying illustrations.

The works in question, which are situated at Oldbury, Birmingham, are fully equipped with modern plant for the manufacture of these boilers; they are provided with a central electric generating station, from which power is supplied to the machines and cranes, which are all driven electrically. The cranes range in lifting power from 5 to 50 tons, and the machine tools installed are of great size and power. Horizontal rolls to bend plates up to 19 ft. 6 in. wide; vertical rolls bending plates in the cold up to

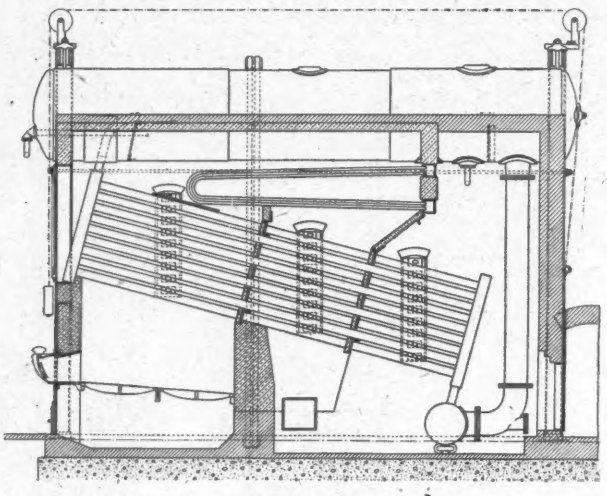


View Showing Improved Cross-Box.

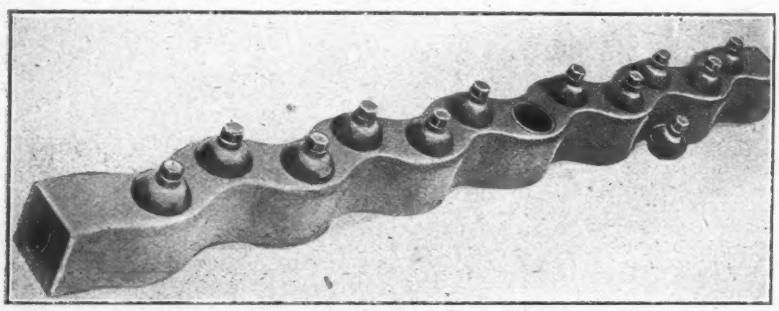
10 ft. 6 in. wide × 1½ in. thick; planing machines for flat plates 30 ft. long, and special circular horizontal planing machines taking up to 10 ft. diameter by 10 ft. 6 in. wide; multiple drilling and boring machines, for drilling holes in shell and drums when the plates are in position; hydraulic riveting machines, portable and stationary; pneumatic and electrical drilling, expanding, caulking and riveting tools and hydraulic presses, some with intensifiers up to 1½ tons per sq. in.—all these are to be found in the works in plenty, and they are not allowed to stand idle. Bituminous gas producers provide gas for heating furnaces, and a large water-gas plant is used to heat materials for welding without injury, the gas being compressed for this purpose.

It will be seen that the equipment of the works for boiler making is well up to date. As regards the new boiler

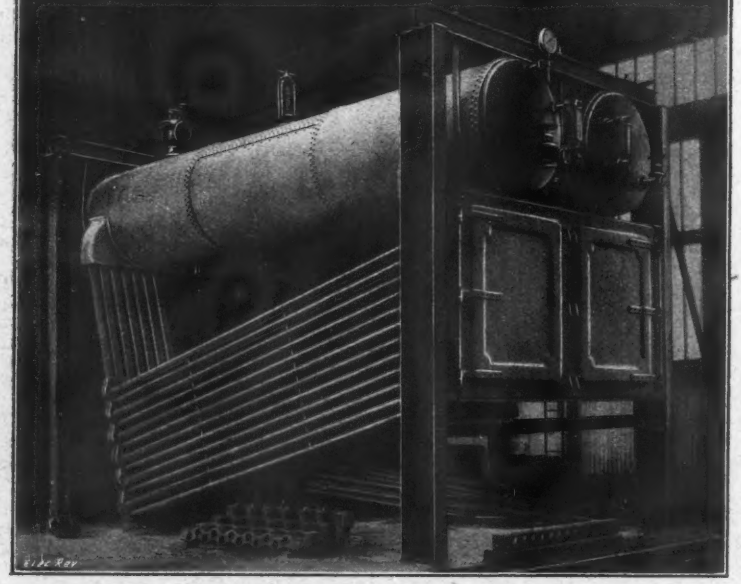
which is being made for the Water-Tube Boiler Co., this is similar in general design to a pattern well known and widely used in electricity works.



"Continental" Type of Water-Tube Boiler.



Staggered Header and Caps.



View of Boiler in Course of Erection at the Oldbury Works.

The steam and water drums are made from the best selected Siemens-Martin acid steel, the edges of all the plates being planed, and the rivet holes drilled in position; the plates are bent in vertical rolls to the true circular form. The ends of the drums are pressed and flanged in special dies at one heat, including the pressing-out of oval manholes. The riveting of the drums, cross-boxes and blocks to receive the fittings is done by hydraulic machinery; and the parts above mentioned are all fullered, caulked, fitted up, and tested to double the working pressure by hydraulic pressure.

The headers are in many cases made from very thick solid-drawn rectangular tubes; when they are welded they are heated by water-gas, and the weld is made by pulling them through rolls with a special hydraulic welder. They are loaded and heated in a gas furnace, and are pressed into a staggered form at one heat under a hydraulic press with special tools. They are then taken to the machine shops, where multiple boring machines rapidly bore the holes for the tubes and the cap holes, which are faced so as to make a perfect steam-tight joint. The caps are so designed that a joint can be made on the inside as well as the outside of the header, a very important consideration, as the joint is held tight by the steam pressure, instead of depending upon the bolt as it does when the joint is made, as is customary, from the outside. These features are shown in the illustration, which we give herewith.

The tubes are made of the best solid-drawn steel, expanded into the header with an electrically-driven tool, so that the same pressure is exerted in expanding each tube. All sections are tested by hydraulic pressure before assembly. The furnace doors are pressed out of a solid plate, and are carefully fitted; being of wrought-iron, they are obviously both strong and light.

The boilers are fitted with hand-fired or mechanically-fired furnaces, the chain-grate stoker being favoured; the latter, with a properly-constructed firebrick arch, gives perfect combustion and high evaporative efficiency.

The firm strongly recommend the erection of the whole of the boilers in a special iron casing lined with firebrick, to prevent the radiation of heat and leakage of air. All the boilers are erected and assembled at the works before dispatch, and every care is taken to supervise the work during construction.

In the design of the new patterns which are now being made, several important improvements have been introduced, which will make for increased efficiency and reliability. The trouble which has been experienced in the past through the defective circulation of water-tube boilers has been overcome by the adoption of headers and connections of much greater capacity than has been customary, giving greater freedom to the circulation, and enabling the boiler to be forced without injury to the tubes; the steam and water drums are also of extra large diameter, to provide ample disengaging surface and thus prevent priming, and to give greater storage capacity.

The cross-boxes are of an entirely new design, as will be seen from the illustration on page 795; ample room is

provided for access to the vertical tubes of the outside headers, for cleaning, &c., thus removing a difficulty of long standing. Special attention has also been given to the construction of the furnace on approved scientific principles, so as to secure perfect combustion of the gases without detriment to the efficiency of the heating surface of the tubes.

Another of our illustrations on p. 796 shows the "Continental" pattern of water-tube boiler which is being made by the firm for the Water-Tube Boiler Co. In this type, as will be seen, the rear cross-box and the vertical tubes are entirely dispensed with, their place being taken by a large downtake, which connects the bottom of the drum to the mud drum. It will be seen that by this means the whole of the tubes are utilised for circulation to the maximum degree possible, for the water has to pass diagonally from corner to corner of the bank of tubes, and every tube is brought into action, instead of the circulation being short-circuited in some, and sluggish or even reversed in others. Provision is made for cleaning the bottom of the downtake.

Modifications have also been made in the design of the steam and water drums. As the figure shows, a compartment or trough below the water level is cut off from the rest of the water space by a partition near each end of the drum. The feed water is introduced into this space, while the uptake from the front headers is brought up over the top of the partition, above a horizontal shelf, in such a way that the hot water rising from the tubes does not mingle with the entering feed water, but forms a layer on the top of the latter. The hottest water similarly passes over the rear partition into the circulation, by way of the downcomer pipe, so that uniform and rapid generation of steam is ensured. It will be noticed that a blow-off pipe is provided at the rear end of the trough, by means of which the sediment thrown down by the feed water can be blown off without passing into the circulation. The drawing shows an ordinary type of superheater fitted to this boiler.

The foregoing does not exhaust the list of improvements effected or contemplated in the design of the boiler, but will serve to show that the projectors of the Water-tube Boiler Co. are determined to depart from the beaten track, and to place on the market a boiler designed in accordance with the most approved principles, retaining all the features which experience has shown to be advantageous, and introducing new ones where experience has equally demonstrated the necessity of improvement. Mr. A. H. Spearing has been appointed managing director of the company, and Mr. A. Venning is the chief engineer; both of these gentlemen are so well known in connection with the boiler-making and steam engineering industry, that any comment on their capabilities would be not only superfluous, but impertinent. The progress of the company will be watched with the keenest interest by central-station engineers and others interested in boilers.

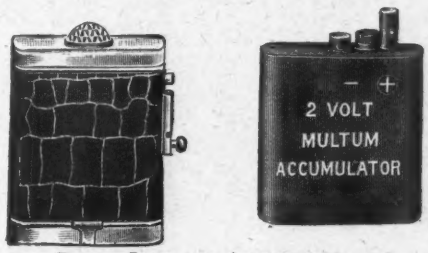
BUSINESS NOTES.

Signs of Trade Revival.—Mr. Alfred Herbert, head of the firm of Alfred Herbert, Ltd., engineers, speaking at a meeting at Coventry, said (reports the *Westminster Gazette*) that there were distinct signs of an improvement in trade generally, and whilst he doubted very much if trade would reach the high figures that it did some time ago, he believed we were on the verge of a steady improvement. He saw indications of this in various directions which pointed to that result, and as far as Coventry was concerned, the fact that new industries were coming into the city was an exceedingly good thing for the working population of the town.

Receiver Appointed.—Mr. C. E. Bullock has been appointed receiver for the debenture-holders in the matter of the Saxon Engineering Co., Ltd., of Fenton, and has taken possession of the assets charged by these debentures.

Bankruptcy Proceedings.—T. J. Phipps, 338A, High Road, Kilburn.—The public examination was held last week at the London Bankruptcy Court, of Thos. Joseph Phipps, who filed his petition in order to avoid arrest under a committal order. In the course of his evidence, the debtor stated that in 1895 he patented an invention for switching off electric lights by clockwork. He spent about £100 in exploiting his invention, and subsequently he was joined in partnership by his brother-in-law, taking premises at 55, Chancery Lane. The switches were made for him in Germany, and cost 7s. 9d. each, his sale price being £1 5s. He had sold £150 worth of them. The partnership was dissolved in 1906, witness being dissatisfied with the conduct of his brother-in-law. So far as he was concerned, the patent was a failure from a financial point of view. He gave up the Chancery Lane offices in 1902 and removed to Kilburn, where he had since carried on business as a watchmaker and jeweller. A creditor obtained judgment against him for £85 in or about 1902, and he was ordered to pay 10s. per month. Under that judgment summons he had paid £25. He made default in 1907 and filed his petition to avoid arrest. Witness attributed his insolvency to losses in connection with the patent. The examination was concluded.

"Multum" Pocket Lamps.—Messrs. Ward and Goldstone, of Springfield Lane, Salford, Manchester, have sent us a couple of their recent pamphlets. One of these gives full and illustrated particulars of their "Melitilite" electric cycle lamps of "Viking," "Standard," and "Popular" patterns. The second pamphlet is devoted to the "Multum" pocket lamp, for which we understand a very large sale has been experienced and from which on one charge, 12 to 14 hours light may be obtained either continuously or intermittently. It contains the "Multum" dry accumulator in moulded ebonite case in one piece. It is claimed that there is no corrosion. In a house lighted electrically by D.C. the battery can be recharged by means of one of the firm's "Indispenso" charging



Pocket Lamp and Accumulator.

sets which are also shown in the same pamphlet. We have tried one of these lamps of the bolt type switch kind with spring control and safety catch, and we have found it reliable and very serviceable—indeed, it is one of those things the usefulness of which one never fully appreciates until he has carried it about in his pocket for some time, making use of it every now and then on the many occasions necessarily arising in the experience of all of us whether as motorists, cyclists, or householders, when it can demonstrate what an acquisition it is. In the accompanying figures we show the 2-volt accumulator and the completed lamp with the bolt-type switch. A slightly cheaper form has a sliding switch in standard case with leatherette covering. For a few additional pence a special ruby lense is supplied for photographers, as well as the ordinary prismatic lense.

Catalogues and Lists. — Foster Arc Lamp and Engineering Co., Ltd., Worple Road, Wimbledon. — Leaflet illustrating Foster's illuminated road signs for dangerous turnings and thoroughfares. Prices are stated for electric, gas, oil and acetylene signs.

The London Electric Firm, Croydon.—New brochure (No. 113) of 32 pages, in which appear half-tone views of places where the firm's patented lowering gear is installed, ranging from the Houses of Parliament and the Royal Albert Hall down to drapers' shops and public houses, and from public street lighting to factory and tramway yard lighting, &c. In size the installations range from 1,000 sets of gear downwards.

Messrs. Johnson & Phillips, Ltd., Charlton.—Two further price lists: "L" dealing with various electric fans for A.C. and C.C., and giving particulars of the circuits for which they are suitable; "G" is devoted to switchboards and switchgear, including dynamo panels, balancer panels, lighting feeder panels and traction feeder panels, of various capacities and suitable for pressures up to 600 volts.

Messrs. Turners & Manville, Hopetoun House, Lloyds' Avenue, E.C.—Two small pamphlets with striking covers, one dealing with asbestos wood, which is claimed to be "tougher than slate or marble—workable as oak"; the other answering the question "What is Voltax?"

Messrs. Pritchetts & Gold, Ltd., 20, Victoria Street, S.W.—Pamphlet consisting of a few advance sheets of a larger catalogue which is to be issued later, relating to the "Pritchett" storage battery. It gives capacities, weights and dimensions of the firm's standard "H" and "C" type cells in glass boxes.

Messrs. John Hetherington & Sons, Ltd., Ancoats Works, Pollard Street, Manchester.—Abbreviated illustrated catalogue of their engineers' machine tools, such as lathes, drilling, tapping and studding machines, universal milling machines, planing machines, &c. A number of views of the various bays at the works are also given.

A.E.G. Electrical Co. of South Africa, Ltd., Caxton House, Westminster.—A number of illustrated lists. One contains a full description of the Quartz enclosed C.C. arc lamp, in which the arc is not formed between the carbon points, but between two mercury poles. The others are devoted respectively to electric ceiling fans for C.C. and A.C., lead-covered junction boxes, current limiting switches, controllers for intermittent service (cranes and lifts), and resistances for intermittent service in connection with controllers.

Messrs. A. P. Lundberg & Sons, Liverpool Road, N.—Ten-page illustrated pamphlet wherein particulars and prices appear of adapters, lengthening connections, twin and triple socket plugs, and miscellaneous plugs for wall connections.

Messrs. Nalder Bros. & Thompson, Ltd., 34, Queen Street, E.C.—New catalogue in case admitting of the addition or substitution of new lists as issued. It contains a great deal of well-arranged matter including numerous illustrations, with tabulated sizes, prices and code-words, as well as diagrams and instructions for working, concerning their well-known instruments. Those given in the lists include automatic accumulator switches, circuit-breakers, electrostatic voltmeters, leakage indicators, moving-coil instruments, insulating testing sets, portable instruments, air-damped soft-iron instruments, high-tension instruments with transformers, wattmeters, and so on.

G.E.C. Distribution Boards.—We understand that the prevailing tendency to cut the price of such articles as distribution boards down to a limit which leaves no margin of profit, is not to be followed by the General Electric Co., Ltd., who intend to retain their usual high quality in this line. Attention to first-class quality, current density of 800 amperes per square inch in all current carrying parts, &c., will not, of course, permit the goods to be sold at the very cheapest prices. The "Peel" switch manufactured by the company is claimed to have withstood the test of time. It has now been on the market a great number of years, and the continued demand for it shows that its quality is appreciated. The tandem-type "Peel" switch has been designed specially for distribution boards with the aim of minimising the space required on the switchboard. While the switch is as effective as the ordinary tandem switch, the space occupied on the switchboard is very small in comparison, and the operation of the switch is understood to be very even and smooth. On the company's standard distribution boards, these double-pole tandem switches have been used, and the board is also fitted with double-pole fuses, the whole being enclosed in a strong teak cabinet with glazed front. These standard distribution boards are made in all sizes and capacities.

Book Notices.—"The Architects' Directory" (Travellers' edition), 1908. Edited by A. C. Freeman. London: British Manufactures Publishing Co., Ltd. 1908. Price 5s. net.

"Outlines of Electrical Engineering." By H. H. Simmons. London: Cassell & Co., Ltd. 1908. Price 21s. net.

"American Machinists' Handbook." By F. H. Colvin and F. A. Stanley. London: Hill Publishing Co. 1908. Price 12s. 6d. net.

"The Week-end and Holiday A.B.C." November. London: 119, Pall Mall, S.W. 1908. Price 6d. net.

"Science Abstracts," Sections A and B. Vol. 11, Part 10; October, 1908. London: E. and F. N. Spon. Price 1s. 6d. each part.

"University of London, University College Calendar, Session 1908-1909." London: Taylor & Francis. 1908.

Bankruptcy Proceedings.—Thomas Ward, late a director of the Electrical Instrument Manufacturers, Ltd., 22, Totteridge Road, Enfield Wash, Ponder's End, late Freezywater, Waltham Cross, Herts.—The public examination of the above debtor was fixed to take place last Monday at the Court House, Edmonton, but the case was not reached.

Trade Announcements.—The business of Mr. J. Scott, electrical and mechanical engineer, known as the Knowsley Electrical Works, at 286, Knowsley Road, Bootle, near Liverpool, is to be taken over by the new company of James Scott, Ltd., registered as a private company, with a capital of £2,500, with Mr. J. Scott and Mr. F. Bradford, as first directors.

The Armorduct Manufacturing Co., Ltd., ask us to again draw the attention of our readers to the fact that their London telephone number is 400 Holborn (two lines), as some of their friends have been inconvenienced by calling up the old numbers.

Dissolutions and Liquidations.—The Telephone Girl Co., Ltd.—This company is winding up voluntarily with Mr. E. C. Hoile, 24, Essex Street, Strand, as liquidator.

St. Helens Cable Co., Ltd.—A meeting is to be held at the offices of Oppenheim & Son, Windle Chambers, St. Helens, on December 3rd, to hear an account of the winding-up from the liquidator, Mr. A. Wenham.

Union Engineering Co., electrical and mechanical engineers, Livesey Fold, Darwen.—Messrs. J. R. Scholes and Thos. Dawson have dissolved partnership. Mr. Dawson will attend to debts and continue the business in partnership with others.

LIGHTING and POWER NOTES.

Aberdeen.—The electrical engineer has undertaken to press forward the arrangements for the extension of the new works at Dee Village so that work may be afforded for the unemployed. The draft agreement between the Suburban Tramway Committee and the Corporation, whereby the price of energy and duration of the agreement will be fixed by an arbiter to be chosen by the Board of Trade, has been approved by the Committee.

The Culter district was last week electrically lighted for the first time. Some 50 twin tantalum lamps have replaced the old paraffin lamps, the new lamps being supplied temporarily by a 20-h.p. oil engine set and battery, until the Aberdeen Corporation supply is connected up.

Accrington.—The T.C. has decided to supply energy to Haslingden T.C. for lighting public arc lamps at 2d. per unit, the latter Corporation bearing all responsibility for any statutory powers being infringed or exceeded in such supply.

With regard to the application by Accrington for a prov. order for E.L., in the name and on behalf of Church and Clayton-le-Moors U.D.C.'s, the T.C. has offered to apply, on the following conditions:—The Corporation to agree to the re-transfer of the order at the end of 14 or 21 years, or at the end of any seven subsequent years, on payment by either U.D.C., of the then value of all mains, works, and appliances, within their district, the value in case of dispute to be settled by arbitration; that the T.C. charge the same price for electricity as is in force at Accrington, or alternatively at such price as may be fixed by arbitration.

Acton.—Sir Alexander Kennedy has issued a supplementary report upon the electricity undertaking. In the course of this he says that the annual loss, which in the first year was £2,615, amounted in the last financial year to £2,934. The total cost for every unit bought from the Metropolitan Co. (including capital charges) was 5·63d., and the average price obtained was 4·25d., there thus being a loss of 1·38d. for every unit sold. Sir Alexander points out that the loss on distribution (9·4) is a reasonable percentage; the high percentage used on the works (16·8) includes the loss on charging and discharging the battery; the very large loss by transformation is due to the fact that the machines in use are by no means efficient, and are unavoidably often worked at low loads. The price actually paid to the Metropolitan Co. was 1·15d. per unit purchased. The agreement with the company is terminable at the end of 9, 18 or 27 years, and the undertaking is now in its fourth year. In regard to an "unofficial" offer made by the company, and which is now under consideration, Sir Alexander writes as follows:—"The Metropolitan Co. are not willing that there should be any reduction in the total income of about £4,000 which they received last year from Acton for current purchased. But they are willing to make such concessions in price as will enable you to obtain a very much larger amount of current for this price than hitherto, and in this way, of course, your price per unit will be correspondingly reduced. Mr. Highfield estimates that, out of the £4,021 which you have paid during the last year, the sum of about £2,800 corresponds to what he considers as standing and capital charges. He is willing to make a proposal to you that your payments in future shall be made up of a lump sum of £2,800 per annum, plus a price per unit of ¼d. Further, he would agree that this scheme of payment shall continue unaltered until your maximum load reaches 500 kw. The effect of this is easily illustrated. For last year your maximum load was 330 kw. and your units bought, 847,916. The total price you would have paid for these on the new scheme would be £3,978—that is to say, a little less than you have actually paid. But if you continue at the same rate, by the time your maximum load has reached 500 kw. your output should have increased to about 1,500,000 units. The price you would pay for this total on the new scheme would be £4,883, which amounts to 0·78 of a penny per unit in total. This is exactly the same figure as you would be charged if the Metropolitan Co. were to put you under such a scheme as that which I mention in my report. After your maximum load reaches 500 kw. Mr. Highfield suggests that the company would consider an addition to the capital charges at some rate below £5 per kw., the charge per unit remaining the same. I think this proposal, if it is officially made to you, is a very fair one."

Blackley.—The electrical equipment of the Prestwich Union Infirmary has been carried out to the specifications of Messrs. Crews & Handford, of Blackfriars Street, Manchester. The scheme is combined with a heating system, and includes electrically-driven lifts, laundry and other machinery. The generating plant includes three Willans-L.D.M. sets, using superheated steam and exhausting through water heaters, the heaters being connected with a low-pressure water heating system. A two-wire system of distribution at 230 volts has been adopted, for simplicity, and a L.D.M. reversible booster and Chloride battery have been installed to steady the pressure. The main cables run to the various blocks in special subways, which also carry pipes, &c., the power mains, covering a small area, have been kept distinct from the lighting mains. Gilbert enclosed arcs and high candle-power Nernst lamps have been used for outside lighting, and arrangements have been made to facilitate the adoption of metal-filament lamps inside, if desired in the future. Messrs. John Collier & Co., of Manchester, supplied the complete electric lighting and power plant; three push-button lifts were supplied by Messrs. J. G. Childs & Co., London, and the electric bell and telephone installations by Messrs. H. Taffs & Co., Manchester. The main switchboard is by Messrs. Dorman & Smith, Salford.

Blackwater.—The Blackwater and York Town Gas Co. (Surrey) is applying for electrical powers for a wide area.

Bridlington.—The T.C. has decided to install a condensing plant at the electricity works, at an estimated cost of £1,100.

Cardiff.—The E.L. Committee has agreed to the substitution of large flame arcs for pairs of smaller arc lamps in the lighting of Queen Street. The flame arcs will be carried on the top of the tramway standards.

Carlisle.—The T.C. has accepted the tender of Pratchitt Bros. (Carlisle), for elevating, conveying, and coal storage plant, at the electricity works; application is to be made to the L.G.B. for sanction to borrow £1,000, the total estimated cost of the scheme.

Chichester.—Messrs. Johnson & Phillips have now commenced to lay cables in this town; the Electric Light Co. has concluded an agreement with the West Sussex Infirmary for the supply of electric light to that institution.

Church and Clayton-le-Moors.—These Councils have intimated to the Accrington Electricity Committee that they are prepared to allow the Corporation to apply in their name, and on their behalf, for the necessary prov. orders under the Electric Lighting Acts, under stipulated conditions.

Continental Notes.—FRANCE.—A hydro-electric scheme is projected on the River Ardèche, near Bourg-Saint-Andéol. The river is to be spanned by a weir, giving a fall of 20 m. and power equal to 10,000 H.P. The cost of this undertaking is put at 1,100,000 fr.

ITALY.—A large central station has been erected at the ironworks of the "Sociedad de Altos Hornos Elba" for the production of the energy required for the working of this new undertaking. The equipment comprises three gas engines supplied by a German firm, utilising the gas from the furnaces and coke ovens, and developing 1,300 H.P. each; they are coupled direct to 5,000-volt single-phase alternators. The electric furnaces are of a new type, of great power and output, and were designed by Don Remo Cartani, the manager of the works.

Application has recently been made to the authorities of the province of Reggio, Calabria, for a concession to put down a plant to utilise the water of the River Sciarapotamo in the generation of electrical energy for lighting and power purposes.

AUSTRIA-HUNGARY.—The communal authorities have decided to erect a hydro-electric station for the supply to this town and the neighbouring towns of Rasch, Schagl, Syrn, &c. The water power will be obtained from the Weissenbach.

GERMANY.—According to a London daily, the Berlin paper *Vorwaerts*, has prematurely published the draft Bill which the German Government intends shortly introducing for taxing gas and electricity—for both lighting and power. It is stated that the tax will amount to, roughly, 5 per cent. on the selling price. Not only are gas and electricity taxed, but also a number of accessories, as meters, burners, incandescent lamps, mantles, &c.

BULGARIA.—A company has been formed in Brussels, under the style of the Compagnie d'Electricité de Sofia et de Bulgarie, with a capital of 3,500,000 fr., for the carrying out of electrical undertakings in Bulgaria.

Conway.—The Board of Trade is being asked to extend the Electric Lighting Order of 1905.

Devonport.—An official inspection of the new mechanical stokers, which have been installed at the electricity works, took place on Tuesday last week. The station is now equipped with five of these appliances from the Underfeed Stoker Co., the cost, including the requisite masonry, having been about £1,300 to £1,400.

Dublin.—The Lighting Committee requires to increase its loan for street lighting from £3,500 to £4,820, owing to further proposals regarding arc lighting. The scheme contemplates the conversion of some 600 lamps from gas to electricity.

Enniskillen (Co. Fermanagh).—This ancient inland town is interested in an electric lighting scheme for the borough and its vicinity. Three companies have laid tenders before the local authorities, and the matter is to be finally settled at a meeting which will be held at an early date.

Epsom.—Messrs. Jackman, Pixley & Co., chartered accountants, are to draw up a statement of the accounts of the electrical undertaking since the Council took it over. This is a reply to the attacks which have recently been made on the Committee as to the conducting of the undertaking.

Fifeshire.—The Rosyth Naval base contract includes an extensive scheme of reclamation below high-water mark. On the ground thus secured are to be erected electric power and lighting stations and other works necessary for the base. The work will begin in February next.

Gillingham (Kent).—The T.C. has appointed a Committee to consider the advisability of the wiring and installation of E.L. fittings in houses let on a weekly tenancy.

Cables are to be laid on the Park Estate, which is being developed, at a cost of £306.

Gloucester.—The T.C. has decided to accept the Sisson engine (which has not fulfilled its steam consumption guarantees) on certain conditions, it being agreed that the firm shall be allowed to try and improve matters at their own risk in future, also that they shall receive £20 in respect of each $\frac{1}{10}$ lb. improvement in steam consumption below 21·8 lb.

Heston and Isleworth.—At the last meeting of the U.D.C. the question of arranging to meet the heavy deficit of £5,000 odd upon the revenue account of the electric lighting undertaking was referred to the Finance Committee, which has reported that the best way to meet the overdraft at the bank consequent on the deficit, is to utilise any surplus upon the current general district rate. The Council has declined to adopt the Finance Committee's views.

Leyton.—At the last meeting of the U.D.C., it was reported that the L.G.B. had sanctioned the borrowing of £1,000 repayable in 60 years for the purchase of additional land for the electric light and power station. In 16 roads, 46 lamps are to be converted from gas to electricity, while nine new lamps are to be erected.

Liverpool.—The most prominent topic in the municipal elections has been, what one of the political parties terms, the "Lister Drive Turbine Scandal." The subject has figured very largely in the T.C. meetings of late. Under the headings of "The Westinghouse Co. and the Corporation," the *Liverpool Daily Post and Mercury*, of Saturday, October 31st, publishes an apology to the company for having unfairly brought its name into an article of October 8th, which summarised the Council's proceedings.

Llandudno.—At last week's monthly meeting of the Council, Mr. Wm. Thomas proposed that the electric arc lamps on the promenade be replaced with incandescent gas lamps, with a view to greater efficiency and economy. Mr. Thomas's statement is to be printed and included in the minutes of the Council, and the whole question referred to the Gas, Water and Electricity Committee for deliberation, and to give the electricity engineer an opportunity to prepare a reply.

London.—POPLAR.—The Electricity Committee of the B.C. has received an application from Stepney B.C. for a stand-by supply of electricity, pending completion of its second generating station at Limehouse. No capital expenditure will be incurred by Poplar Council, as the spare plant at the main station will be sufficient to afford the supply, while the expenses of coupling up the mains is to be borne by Stepney. It is pointed out that it is possible a reciprocal arrangement may be of benefit to Poplar on some future occasion. The Electricity Committee, therefore, recommended, and the Poplar Council agreed, to provide Stepney with a supply of electricity to the extent of 500 KW. at any time during the period ending September 30th, 1909, at a cost of £100 for the right of taking a supply, whether it is taken or not, and a further sum of ¾d. per unit for each unit actually taken. In the event of a breakdown or insufficiency of its plant, Poplar has the right to cut off the supply.

WANDSWORTH.—The County of London Electric Supply Co. has asked to be allowed to erect in certain positions in the borough some specimen lamps for the purpose of demonstrating the efficiency of electric lighting as compared with gas for street lighting; permission is to be granted under protective conditions.

FULHAM.—The electrical engineer has for some three or four months been experimenting with metallic-filament lamps for street lighting, and the result has proved that the Osram lamp gives the most satisfaction. Arrangements have been made with the makers of the Osram lamp to guarantee an average life of 1,100 hours. The engineer's idea is to change the whole of the 32-C.P. carbon-filament lamps to 200-volt 75-C.P. Osram lamps, the effect of this being, so far as annual cost of running and upkeep is concerned, that the inclusive cost for Osram lighting (75 C.P.) would be £3 1s. 2d., as against the existing 32-C.P. carbon-filament lamp at £3 6s. The total cost for fitting up approximately 350 lamps is £185 15s., and the Committee has decided, subject to the usual sanction, to carry out the work immediately.

MARYLEBONE.—The Electric Supply Committee recommends that a Sub-Committee be appointed to consider a proposal for lighting the streets with electricity. Owing to the large lighting and power supply which Messrs. Selfridge & Co. require at their new premises in Oxford Street, it will be necessary to carry out certain extensions to the distributing system. This work, which will cost about £3,000, is to be put in hand forthwith. The Committee consider the present is a good opportunity for adopting electric street lighting generally. The whole of the lighting in those streets in which mains are already laid, can be done electrically for £8,650 for the first 10 years as against a charge of £8,818, the cost of the present gas lighting; while after 10 years the charge for electric lighting will be only £8,130. The work can be executed by next March, and would necessitate the employment of a large number of men, the wages for whom would amount to about £4,000.

New South Wales.—According to the *Financier*, specifications are being prepared for an extensive additional electric lighting scheme for Sydney, and an application is to be made to Parliament for power to borrow a quarter of a million sterling for the purpose. The city electrical engineer, in advising the installation of additional generating and converting plant to cope with the increased demand, submitted the following estimate:—Two 4,000-KW. generators, at £20,000 each; one 400-KW. generator, £2,750; one 400-KW. transformer, £450; switchgear (at power house), £2,480; crane, £850; boilers, with superheaters and stokers, five at £2,600 each; pipework, valves, feed pumps, economisers, tanks, &c., £7,230; coal and ash conveyor, £1,900; sub-station motor-generators, three at £3,200 each; sub-station switchgear, £1,150; a total of £83,410. The city building surveyor reported that the requirements in the proposed extension of the generating station at Pyrmont, would involve the following expenditure:—Buildings, £40,000; chimney-stack, £3,600; extension of conduit, £3,400; total, £47,000.

St. Helens.—A L.G.B. inquiry was held on Tuesday relative to the application of the T.C. for sanction to borrow £10,426, for purposes of its electricity undertaking. Mr. Hollingsworth, borough electrical engineer, said the necessity for the loan arose through the increase in the demand for electric power, and the money would be mainly spent in providing plant, &c., for power purposes.

Shrewsbury.—The T.C. has decided to apply for powers to supply and hire out fittings, apparatus, &c., for electric lighting and power.

South Shields.—The T.C. has agreed to allow the Durham E.L. Power Co. to lay power feeders to the Harton Coal Co.'s collieries in the borough, at an annual rental of £250.

Stoke-on-Trent.—The L.G.B. having refused to sanction portions of a loan applied for for electricity purposes, the T.C. on October 28th decided to send a deputation to lay before the L.G.B. the Council's views on the matter, and to request Mr. John Ward, M.P., and Mr. Albert Stanley, M.P., to accompany the deputation.

Tayport.—Mr. Stewart, of Wormit, in the course of a lecture on "Electricity *v.* Gas," has proposed a scheme for the introduction of electricity in the town, and advises the Council to consider it before taking over the gas undertaking.

Wadebridge.—A meeting of the parishioners of Egloshayle was held at Wadebridge last week, and amongst other matters the question of installing electric light or gas in the place of existing oil lamps was discussed. An offer was received from the Wadebridge and District Electric Supply Co. and another from the Wadebridge Gas Co., but on a ballot it was decided, by 43 votes to 14, to adopt electricity in preference to gas.

Walton-on-Naze.—The U.D.C. has accepted the tender of the Coast Development Co. for public lighting for five years, with 50-C.P. lamps at £2 12s. 6d. per lamp per annum.

Wolverhampton.—The T.C. has applied to the L.G.B. for a loan of £6,000 for electricity purposes.

TRAMWAY and RAILWAY NOTES.

Bath.—The Light Railways Commissioners have submitted to the Board of Trade for confirmation the Bath Electric Tramways (Light Railways Amendment) Order.

Birmingham.—The Corporation Tramways Committee has decided to proceed with the extension of the tramways to Handsworth. The cost will be £15,000.

Bolton.—It is officially announced that the decreased receipts on the local tramways, owing to the cotton trade lock-out, amounts to £25 or £30 per week. Over 6,000 operatives who used the car service are out of work.

The T.C., on Wednesday last week, confirmed the decision of the Tramways Committee to apply for a provisional order for the construction of additional tramways within the borough, notably to the Darcy Lever and Brownlow Fold districts. These districts have lately been served by a motor-'bus service. The borough engineer has been instructed to prepare plans, estimates, &c.

Cairo.—The tramway strike is stated to be over, a majority of the men having returned to work unconditionally About 200 strikers were arrested in attempts to prevent the running of the cars.

Continental Notes.—Sweden.—The trials of electric working on the railways from Stockholm to Jarfra, and from Timteboda to Vartan, carried out by the Government engineers, have proved satisfactory, and it has been decided to electrify the whole of the Swedish State railway system, beginning at Bollnäs, 200 miles north of Stockholm, and ending at the south coast. The State has already acquired many of the waterfalls, which will be used for the production of energy. According to the estimates of Mr. Dahländer, chief engineer of the electrical department of the State railways, the total length of the projected lines is 1,400 miles. The energy will be transmitted at 50,000 volts, and transformed down to 15,000 volts for the railways. Some 37 transformer stations at distances of 30 miles apart are contemplated. The total outlay on transmission lines, transformer stations, &c., will be about 47,600,000 kr., and for the power stations 32,300,000 kr., or a grand total of about 82,000,000 kr. The working cost for electricity on the basis of the 1905 railway working figures is estimated at 7,890,000 kr.

Austria-Hungary.—The Diet has decided to grant a subsidy of half a million crowns for the construction of a new electric railway in the Tyrol to link Cortina di Ampezzo with the line from Pusterhal to Toblach.

Italy.—A company has lately been formed at Clusone, with the title La Società Ferrovia Elettrica Ponte Nove, to construct and work a light electric railway in the district.

Russia.—The municipality of Moscow has been authorised to contract a loan of 9,000,000 roubles for the construction of electric tramways.

France.—The Conseil Général has voted a sum of £259,200 for the construction of tramways, comprising the following lines:—Châtelleraut to Bouresse, Lencloitre to Lusignan, and Poitiers to Lervansseau. Lines of tramways are likewise sanctioned or projected in the following places:—From Aubagne to Gemenas, in the Department of the Bouches-du-Rhône; Saulieu-Semur to Montbard and Chatillon-sur-Seine; Riberac to Montpon and Laroche-Chalais, in the Dordogne; Valenciennes to Somain, Département du Nord; Suresnes to Garches, Seine; and Mantes to Rambouillet and Septeuil to Bréval, Seine-et-Oise.

The substitution of electric for steam traction on the tramway lines of Cherbourg has been officially approved by the Conseil Général of the Département.

Glasgow.—The town clerk has informed Messrs. Richardsons, Westgarth & Co., the contractors for the turbo-alternator set for the Pinkston power station, that after the contract has been completed, the Corporation will consider whether or not any abatement of the penalty for delay provided for in the contract shall be allowed them. The firm stated that they had now a full complement of men at work on the contract, and asked for an extension of the delivery date.

Glossop.—Steps are being taken for the linking up the tramways in the district where the boundaries of Lancashire, Cheshire and Derbyshire meet. The proposal is to seek Parliamentary powers for electric tramways to connect the existing Corporation tramways of the Stalybridge, Hyde, Mossley and Dukinfield Joint Board with the Glossop and Hadfield tramways, *via* Mottram and Woolley Bridge (Glossop). It is intended to construct a new bridge for the tramway over the Etherow. The total route mileage would be about 7 miles. Long single-deck cars of the partly-open type, similar to those in use in Manchester, are proposed, as being more suitable for runnning over the stiff gradients in the vicinity of Mottram. It is also possible that battery traction may be adopted instead of the overhead trolley system. The promoters anticipate that the Bill will go forward as an unopposed measure. The engineers for the scheme are Messrs. John M. Newton and J. W. Welch, of Manchester.

London.—At Tuesday's meeting of the L.C.C. the Highways Committee submitted a recommendation in favour of application being made to Parliament in the session of 1909 for authority to establish and work a service of electric cars on the trackless trolley system, from the terminus of the existing tramways in Blackwall Lane *via* Blackwall Tunnel to East India Dock Road, and from Deptford Lower Road *via* Rotherhithe Tunnel to Commercial Road East. The recommendation was referred back; the expenditure was estimated at £17,000.

The Committee also reported having received from Mr. W. M. Mordey his report on the subject of the G.B. surface contact system on the Aldgate to Bow tramways. It had had an interview with him, at which he explained certain matters dealt with in the report. The Committee was communicating with the G.B. Surface Contact Co. with regard thereto, and proposed to report fully to the Council next week. The Committee further stated that it had had its attention drawn to the frequent delays which have occurred on the Kingsland Road tramways, through the car ploughs becoming jammed at the points where the centre slot changes to side slot and *vice versa*. It is thought that the difficulty might be overcome if the slot diversions, where the change from centre to side take place, which are at present made in lengths of 19 ft. 3 in., with a radius curve of 40 ft, were altered to a length of 32 ft. 8 in. with a curve of 200 ft. radius. The cost of altering the whole of the 12 diversions on this route is estimated at £1,000.

On November 2nd, the L.C.C. started an experimental night service of cars from Holborn to Finsbury Park.

Hammersmith.—A letter has been received from the Board of Trade to the effect that the London United Tramways, Ltd., has applied to it under Sec. 33 of the Tramway Act, 1870, to appoint an engineer, or some other fit person, to settle the difference which has arisen between the B.C. and the company as to the condition of the tramway tracks. The town clerk has replied, expressing the Council's disagreement with the company's contention that the difference calls for the arbitration of the Board under the section in question.

On Sunday last, the motor coach of a Hammersmith train on the G.N. and Piccadilly tube caught fire; the driver succeeded in running into Earl's Court Station, when the passengers were got out and power cut off the line. The occurrence involved a delay of about 25 minutes to the traffic.

Oldham.—The T.C. has decided to promote a Bill next Session, which, amongst other things, will include powers for the construction of a tramway from the district of Moorside to Grains Bar, on the Yorkshire boundary near Saddleworth.

Preston.—The inter-section ticket system on the Preston tramways is said officially to have been so far a great success. Last year 320,000 tickets were issued, an increase of 100,000 over the previous year.

Rhyl.—A private conference was held last week between the U.D.C. and representatives of the Llandudno Light Railway Co. (including Mr. Sellon) to consider the question of a light railway from the entrance to the pier at Rhyl, as far as Prestatyn. Mr. Sellon said the company was in a position financially to carry out the project forthwith if the Council would agree to the scheme, and it would be prepared to take electricity from the Council. The Council in Committee approved of the scheme, and a special meeting will be called to legally give it sanction.

U.S.A.—According to the *Times*, the Pennsylvania Railroad Co. has entered into a contract with the Westinghouse Electric Co, for the electrical equipment of the New York and Long Island terminals, the minimum estimate being over £1,000,000. It is stated that other trans-Continental railways are also considering the same problem.

Wallasey.—Plans have been submitted to the U.D.C. Tramways Committee for two alternative schemes in connection with the proposed tramway extension to Wallasey village, and it has been decided to submit for the approval of the Council the St. George's Road route, the estimated cost of which is given at £83,160.

TELEGRAPH and TELEPHONE NOTES.

Italy.—The *Messaggero* states that the Minister of Posts and Telegraphs is much occupied with the excessively rapid development of the telephone systems in the large cities and villages of Italy. Considerable expenditure will have to be incurred in increasing the trunk lines in different parts of the country, and there is also some difficulty in getting the operators sufficiently well trained to take up the new duties. The *Messagero* points out that a good deal of the work might be advantageously done by telegraph if the tariff were reduced, thus relieving the telephone trunk lines.

Post Office Telephones.—In reply to a question in Parliament, Mr. Buxton admits that, while the National Telephone Co.'s service is continuous, the telephone service given by the Post Office at small exchanges is in many cases confined after 8 p.m. to the hours during which the staff is on duty for other purposes. The cost of special attendance all night and on Sundays would render the establishment of such exchanges impracticable.

Telegraphic Interruptions.—

Port Arthur-Chifu	... ...	March 9, 1904
Rhodes-Sitia	... ...	Sept. 17, 1908
Cotonou-Grand Bassam	... ...	Oct. 29, 1908

Telephone Charges.—The National Telephone Co. last week sued Messrs. Davis, Turner & Co., Ltd., of 52, Lime Street, E.C., for £7 6s. due for message-rate telephone calls. For April, 1,439 calls were registered against the defendants. The Judge said he could not believe that so many calls were made, and found for the defendants, with costs.

Telephone Rates.—The Telephone Committee of the Association of Chambers of Commerce has declined to accept the nominee of the Liverpool Chamber, Mr. Charles Lancaster, as a delegate; the Liverpool Chamber has therefore declined to take any part in the proceedings, being satisfied of Mr. Lancaster's disinterested motives. We contratulate Liverpool on its independence and freedom from prejudice.

Wireless Telegraphy.—Giving evidence before the Postal Commission in Melbourne on September 30th, Mr. Hesketh, chief electrician to the Commonwealth Government, stated that in his opinion wireless telegraphy was not justifiable for commercial use in the Commonwealth; tenders for wireless stations had been invited, in order to ascertain their cost, and the Defence Department and the P.M.G.'s department recommended installations at Fremantle, Sydney, Cape York, Thursday Island, Port Moresby, Melbourne, and Cape Borda. The traffic between Victoria and Tasmania was sufficient to keep two cables working on the duplex system, and was beyond the capacity of wireless telegraphy.

The *Journal Télégraphique* of October 25th, 1908, publishes the text of the Japanese service regulations for international radio-telegrams.

CONTRACTS OPEN and CLOSED.

OPEN.

Algeria. — Bone. — January 15th. The municipal authorities of Bone—a town of 43,000 inhabitants—is inviting offers for the establishment and working of a central station for public and private electric lighting and power purposes, and for the construction and operation of a system of electric tramways. The Municipal Council will give a guarantee in respect of the tramways, and give the land on which to build the generating station.

Australia.— Tasmania. — March 15th, 1909. Postmaster-General. Telephone switchboard, common-battery system and apparatus for use at subscribers' premises, Launceston. Specifications and particulars of general conditions can be inspected at the offices of the Electrical Review.

Victoria.—Three sets of testing instruments, for the P.M.G. See "Official Notices" October 16th.

Victoria.—Submarine cable-repairing plant for the P.M.G. See "Official Notices" to-day.

Belgium.—November 11th. Tenders are required by the Direction of the Belgian State Railways for an electric signalling cabin complete at the Nord Station. Particulars No. 260, 1908, are obtainable from Mr. de Rudder, 11, Rue de Louvain, Brussels.

Colchester.—November 30th. Electric lighting plant, motors, wiring, telephones, &c., for the Essex County Lunatic Asylum. See "Official Notices" October 30th.

Dublin.—November 30th. Stores for the Dublin United Tramways Co. (1896), Ltd. See "Official Notices" October 30th.

Eccles.—November 14th. Electric light wiring and fitting of the Cleansing and Scavenging Committee's buildings at the Town's Yard. Specification prepared by the borough electrical engineer is obtainable from the Town Clerk, Town Hall.

Germany.—Halle-am-Saale.—The municipal authorities are about to invite tenders for the extension of the electricity supply undertaking, at an estimated cost of £100,000.

G.W. Railway. — November 10th. Stores for the G.W. Railway. See "Official Notices" October 2nd.

Italy.—Tenders are about to be invited for the supply of the machine tool equipment of the Government railway workshops in Rome.

Leigh.—November 7th. Steam slack for the B.C. electricity department. See "Official Notices" October 23rd.

Leith.—November 10th. Materials for tramway extension for the Corporation. See "Official Notices" October 30th.

November 10th.—Underground cables for Corporation extension. See "Official Notices" October 30th.

London.—November 10th. Overhead equipment for the electrification on the overhead trolley system of the L.C.C. tramways from Loughborough Junction to Norwood, from Hammersmith to Putney, and from Streatham to Norbury. See "Official Notices" October 30th.

Manchester.—November 17th. Steel tie-bars, bolts and nuts for the T.C. J. M. McElroy, General Manager, Tramways Department.

Middleton.—November 11th. Three-core distributor cable for the T.C. S. Pauls, Electricity Works, Townley Street.

Thrybergh.—November 9th. The lighting of certain streets, roads and places in the parish by electricity. Mr. O. Everitt, Clerk to the Parish Council, 4, Clifton Bank, Rotherham.

Wakefield.—November 19th. Stores for the Wakefield and District Light Railway Co. See "Official Notices" to-day.

CLOSED.

Accrington.—The Tramways Manager submitted quotations to the Electricity Committee last week for stores required. The tender of Messrs. Baker & Co., Rotherham, was accepted for car wheels, tires and axles; also that of Messrs. J. W. Bridge, Ltd., for "Hyper-Acme" chain blocks.

Argentine.—Messrs. Browett, Lindley & Co., Ltd., of Patricroft, have received an order from the British Westinghouse Co. for three of their triple-expansion engines, each capable of an output of 1,000 kw., for the Buenos Ayres and Pacific Railway Co. They are intended for the Bahia Blanca power scheme, and are to be constructed to the specification of Mr. J. F. C. Snell. They will be similar to engines which they have recently supplied to the Sheffield Corporation, Staveley Coal and Iron Co., and the Finchley Urban District Council.

Australia.—Sydney :—

R. Johnson, Clapham & Morris, Ltd., 107, Pitt Street, Sydney.—100 tons wire, galvanised iron (150 lb. per mile), £13 10s. per ton.
Gibbs, Bright & Co., 37, Pitt Street, Sydney.—50 tons wire, galvanised iron (200 lb. per mile), £11 4s. 5d. per ton.

Adelaide.—For Postmaster-General's department, telegraph and telephone instruments and materials:—

Lawrance & Hanson, York Street, Sydney.—Bells and condensers.
Oswald Haes, 2, Hunter Street, Sydney.—3,800 cells, Leclanché, No. 2 size.
R. Johnson, Clapham & Morris, Ltd.—Five tons wire, copper (100 lb. per mile), £70 10s. per ton; one ton wire, galvanised iron tie (60 lb. per mile), £15.
George Wills & Co., Grenfell Street, Adelaide.—Ten tons wire, phosphor bronze (70 lb. to the mile), £79 3s. 9d. per ton; one ton wire, phosphor bronze (50 lb. to the mile), £79 3s. 9d.
Zwicker, Tod & Co., Melbourne.—3,000 insulators, porcelain, No. 5, at $5\frac{5}{8}$d. each; 10,000 insulators, porcelain, No. 6, at $2\frac{3}{16}$d. each.
Unbehaun & Johnstone, Currie Street, Adelaide.—3,000 insulators, porcelain, No. 8, at $1\frac{1}{2}$d. each.

Barnstaple.—Messrs. Edmondson & Co. have secured the contract for the electric light installation at St. Mary Magdalene Church.

Bootle.—The T.C. has accepted the tender of Messrs. Campbell & Isherwood, Ltd., of Bootle, for re-wiring for electric lighting at the refuse destructor works, at £50.

Burnley.—The T.C. has accepted the following tenders :

Clegg Bros., Burnley.—Construction of bed of new engine and dynamo, £217
Société Anonyme Westinghouse.—Condensing plant, £795.

Cape Town.—For the extension of the steam-raising plant required in the electric light works, Dock Road, only one tender was received—viz., from Messrs. Babcock & Wilcox, who undertook to supply and install the requisite machinery for the total sum of £4,990; this was accepted by the T.C.

Carlisle.—The tender of Messrs. Pratchitt Bros., of Carlisle, has been accepted by the Corporation for coal elevating, conveying and storage plant at the electricity works, at £646.

Epsom.—The U.D.C. has accepted the tender of Messrs. Pritchetts & Gold, Ltd, for a storage battery for the electric light works. It will comprise 210 cells.

Ilford.—The U.D.C. has accepted the tender of Messrs. Herbert Morris & Bastert, Ltd., for an overhead travelling crane, at £252, and that of Messrs. Norton Bros. & Co for extension of the switchboard gallery, at £53.

Kingston-on-Thames.—The T.C. has accepted the tender of Messrs. Siemens for the supply of five lengths of cable, at £213.

London.—Stepney.—The B.C. has received the following tenders for temporary switchgear required to connect up the motor-converter with the Poplar supply :—

	Items A to G.	Omitting items F and G.
Johnson & Phillips .. (accepted at £93 5s.)	£160	£93 5
Union Electric Co.	166	108 0
Wm. White & Co.	171	102 0
Electric Co.	171	196 0

For motor fans and air ducts in connection with Blyth's Wharf extension scheme :—

Matthews & Yates, £628 (incomplete); alternative, £744.
Sturtevant Engineering Co., £732.
Davidson & Co., £660; alternative (accepted), £690.
Babcock & Wilcox, £684; alternative, £722.
Underfeed Stoker Co., £741.

Hammersmith.—The B.C. has placed an order with the General Electric Co., Ltd., at £117 and £22, for two low-tension switchboards required in connection with the Council's sub-station at the works of the Wolfram (Tungsten) Metal-Filament Lamps, Ltd.

L.C.C.—The Highways Committee proposes to accept the offer of the Frodingham Iron and Steel Co, amounting to £13,017, for the supply of slot and conductor rails, and that of Bolckow, Vaughan and Co., at £8,150, for track rails and fastenings. The firm of Walter Scott, Ltd., quoted £8,291 for the latter contract.

Longton.—The T.C. has accepted the tender of the Borough Electricity Committee for installing the electric light at the baths, at £57 15s.

Salford.—The T.C. has accepted the tender of Messrs. Carter & Sons, Ltd., for a hoist for the car depôt, at £38 10s.; and that of Messrs. Hodgson & Stead for a weighbridge for the car depôt, at £75.

Swindon.—The Board of Guardians has accepted the tender of Messrs. Green & Son for an economiser, at £125 10s.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDEEN.—New Dock on the Dee and reconstruction of wharves in Albert Basin (£85,000); engineer, Aberdeen Harbour Board. Dwelling house in Burns Road; John Buchan, builder, Aberdeen. Two dwelling houses, University Road; J. Milne, architect, 254, Union Street, Aberdeen. Six dwelling houses, Sunnyside Road; J. Shirras, builder, Aberdeen. Addition to premises, 96, Huntly Street; W. and A. Hay, cabinet makers, Aberdeen.

ABERDEENSHIRE.—House for farm of Mossfield-Glack Estate. Edmonds and Ledingham, Golden Square, Aberdeen.

ARMLEY (Yorks.).—New Church of St. Hugh (£3,500). H. S. Chorley, architect, Park Place Chambers, Leeds.

ASHFORD (Middlesex).—Mixed secondary school (200 scholars). Middlesex Higher Education Committee.

AVELEY (near Purfleet).—New County Schools (£1,701). H. J. Carter, builder, Grays.

BACUP.—New elementary school in the Weir district (£6,000); development of estate at Lanehead into Garden City.

BARNSLEY.—Houses, Blenheim Gardens, for S. and E. Cowood; Denton Street, for George Firth; warehouse, off York Street, for Holden Bros.; Institute, for the Wardens of St. John's Church; wholesale market shops for the T.C. (£1,100).

(Wombwell).—New premises in Station Road, for the Salvation Army.

BARROW-IN-FURNESS.—Dwelling house; Z. Bennett, Strand, Barrow. Two dwelling houses in Lord Street; Thomas Kellett, Barrow. Four houses in Newbarns Village; W. Hatton. Twelve houses in West View Road; J. H. Neal, Barrow. Proposed establishment of works for manufacture of pitch, creosote, &c., in connection with gas works; Barrow Corporation. Laundry at the Workhouse at Roose, for the Board of Guardians; H. T. Fowler, architect, Cornwallis Street, Barrow-in-Furness.

BATLEY.—Two houses off Norfolk Street. J. H. Brearley, architect, Commercial Street, Batley.

BEDLINOG (Glam.).—Proposed new school. T. Mansel Franklin, Clerk to the Glamorgan C.C., Cardiff.

BERWICK-ON-TWEED.—Extensive alterations to premises, for R. K. Gaul, house furnisher, Hide Hill.

BEXHILL.—Detached house, Collington Avenue, for W. White; G. F. Maynard, Ltd., architects. Pair of semi-detached residences, Collington Avenue, for C. G. Brown; G. E. Maynard, Ltd., architects.

BIRMINGHAM.—New school in City Road and Poplar Avenue, Rotten Park (600 scholars), Birmingham Education Committee.

BRACEBRIDGE (Lincolnshire).—Additions to girls' school. Lincolnshire County Surveyor, 53, High Street, Grantham.

BRENTWOOD.—Cookery and woodwork centre for Essex E.C. (£1,180). Crowe and Browne, architects, Brentwood.

BRIDGEND.—Extensive alterations to Llangan Rectory, for Rev. Owen Jones. G. E. Halliday, architect, 19, Castle Street, Cardiff.

BRIDLINGTON.—House, Richmond Street, for Sampson & Siddall; house, Carr Lane, for R. Bailey; house, Roundhay Road, for T. Gray house, North Street, for J. Bowman; alterations to premises, Manor Street, for G. T. Knaggs; stable and motor garage, Cardigan Road, for E. F. Phillips.

BRIGHTON.—Place of worship for Horeb Tabernacle (£1,100); Rev. E. V. Mulgrave, pastor.

BROADSTAIRS.—Additions to "Coquetdale," St. Peter's Park Road, for E. C. Cockett; additions to Carlton Hotel, J. T. May, builder, High Street; additions to "Cameron," Callis Court Road, for L. C. Shadwell; houses, West Cliff Road, for Mrs. Northover; St. George's Road, for C. Culver.

BROMLEY.—House, Edward Road; D. Deadman, builder, 7, Farwig Lane, Bromley.

BROUGHTY FERRY.—Proposed new lifeboat house (£1,700). Mr. Hunter, solicitor, Dundee, secretary of Lifeboat Committee.

BURNLEY.—Manse, for pastor of Claremont, U.M.F. Church; the Trustees, Claremont Chapel, Padiham Road, Burnley. New dye works in Calder Vale; H. Greenhalgh & Co., dyers, Burnley. Electrical installation for the new Technical School. J. E. Starkie, Borough Electrical Engineer, Electricity Supply Works, Burnley.

BURTON-ON-TRENT.—Schools, Guild Street, for Rev. J. M. Flynn. Thos. I. McCarthy, architect, Central Chambers, Coalville, Leicester.

CAMBRIDGE.—New vestries at the Church of St. John the Evangelist, Hills Road (£900). Rev. A. E. Love, vicar.

CANTERBURY.—Two residences, St. Augustine's Road, Canterbury. Clarke and Epps, builders, Maidstone, Kent.

CARDIFF.—Probable re-building, after fire, of corn mills and stores, West Bute Dock, for H. Leetham & Sons.

CARSHALTON.—Additions to Carshalton House, for Mr. Tapley; houses, Cowper Avenue, for Faulkner & Sons; Hawthorne Road, for Windebank & Co.

CASTLEBLAYNEY (Co. Monaghan).—New Post Office. J. F. M'Gahon, architect, Roden Place, Dundalk.

CASTLEFORD (Yorks.).—Eighteen houses, Garden Street, for Galagher Bros., builders, Morrison Street.

CHARLTON (Kent).—Congregational Church Hall, junction of Wyndcliff Road and Bramshott Avenue (£2,600). Rev. S. Lloyd Davis, pastor.

CHATHILL (Northumberland).—House at North Sunderland for Mrs. E. McDougal.

CHESTER.—Alterations and additions to the Municipal Offices, for the T.C.; W. T. Lockwood, architect, 88, Foregate Street, Chester. Refuse destructor for the T.C. in connection with the electricity works (£10,966).

CHIPPENHAM.—Alterations to Willow House, for Sir John Dickson Poynder; houses, Pickwick Road, for E. B. and W. Head.

CHORLEY.—Nine houses, off Eaves Lane, for Arthur Tromans.

CHURCH (Lancs.).—Nine houses, Dill Hall Lane, for J. Grimshaw, builder, Dill Hall Lane.

COOKHAM.—Rebuilding Bleak House, Pinkneys Green, for Mr. Ewen; houses, Cookham Dean, for W. Baldwin; Bath Road, for Mr. Naylor; Lock Mead, for F. T. Castle; Furze Platt, for W. Gilroy; Bath Road, for N. R. Henry; additions to Fir Croft, Cookham Dean, for G. P. G. Hills; alterations and additions, Tythe Barn, Cookham Dean, for W. H. Crow.

CRADLEY HEATH.—Works for the manufacture of enamelled and galvanised goods, near Lomey Town, for Mr. Stevens, hollow-ware manufacturer.

CREWE.—Proposed new police station in Ford Lane. County architect, Chester.

CROMPTON (Lancs.).—Twenty-five houses, Shaw Lodge Estate, for James White.

CUDWORTH.—Houses, off Pontefract Road, for T. Winter; Pontefract Road, for H. Slater; Albert Street, for J. Stothard.

DARLINGTON.—New girls' high school for Durham C.C. (£12,000).

DARTFORD.—Extension of Spital Street Wesleyan Church and new Sunday Schools (£4,900). Rev. S. L. Evans, pastor.

DARTMOOR.—Establishment of peat works, to be electrically equipped.

DERBY.—Extension of the Royal Institution for the Deaf and Dumb (£5,000). A. Eaton, architect, 6, St. James' Street, Derby; Ford & Sons, contractors, Derby. New church in connection with Ashbourne Road Congregational Church (£3,000); A. Wilson, architect; H. Vernon, builder, Drewery Lane, Derby.

DONCASTER (Thorne).—New temperance institute (£1,066). E. Chambers, architect, 24, Boothferry Road, Goole; W. Drury & Son, builders, Thorne.

(Bentley).—New Sunday Schools in connection with St. Peter's Church. Mr. Simmons, architect, Doncaster.

Extensions to the market buildings for the T.C. Borough Surveyor, 8, Priory Place, Doncaster.

DUNDEE.—Shops, offices, and warehouse at 4, King Street, for Leslie Ower; alterations to property, 13, Overgate, for I. B. Murray; Salvation Army Hall in Constitution Street, for O. Archer; suggested extension of the Dundee Eye Institution.

EAST AND WEST WHORLTON (Northumberland).—Extension of the County Schools (£2,256). J. C. Mather, builder, Gateshead.

EASTBOURNE.—Additions to Canfield, Saffrons Road, for O. C. T. Eagleton; F. G. Cooke, architect, 8, Hyde Gardens. House, Kitchenham Road, for T. Dunlop; A. A. Oakden, architect, 10, Cornfield Road. Two houses, Milton Road, for J. McCann; A. E. V. McCann, builder. Additions to Grand Hotel, Compton Street, for the Grand Hotel Co., Ltd.; C. Breach, builder. House, Prideaux Road, for W. Wales-Smith; P. D. Stonham, architect, 17, Gore Park Road. Additions to Bishopsbourne, Carlisle Road, for H. Kent; M. Martin & Sons, builders. House, Summerdown Road, for T. Dunlop; J. W. Woolnough, architect. House, Prideaux Road, for Miss Davis; P. D. Stonham, architect, 17, Gore Park Road. Six cottages, St. Anthony's Hill, for J. T. Wenham; Mitchell & Ford, architects, 7, Gildredge Road. Additions to Motcombe Farm House, Motcombe Road, for the Duke of Devonshire; Architect, Compton Estate Office. Additions to Queenscliffe, Carew Road, for H. Southall; additions to Rockfield, Arlington Road, for A. J. Fletcher; additions to Melrose, Carew Road, for Mrs. Spence; additions to 21, Carleton Road, for C. O'Hara; addition to Denmark House, Morcombe Road, for A. Gausden.

ECCLES.—Extensions to works at Patricroft, for Nasmyth, Wilson & Co., Ltd., engineers.

EDINBURGH.—New offices for the United Free Church of Scotland, 119 and 121, George Street, Edinburgh; John Lownie & Son, builders, 57, Harrison Road, Edinburgh. New Lockhart Memorial Church in the Grange district.

(*Continued on page* 811.)

THE DEVELOPMENT OF THE ALUMINIUM CORPORATION, LTD.

Probably one of the most remarkable demonstrations of the economic value of the application of electricity to chemical processes will be found in the way in which aluminium has taken a leading place among the metals in ordinary use. As recently as 1886, aluminium was as rare and valuable as silver, being sold at 5s. per oz.; to-day, as the result of electrochemical manufacturing processes, it can be obtained at considerably under 1d. per oz. In 1886, the annual production of metallic aluminium was under 50 tons; to-day, at the least estimate, it is being produced at a rate of over 20,000 tons per year. The manufacture of aluminium is now a world-wide industry; extensive plants are in operation at Niagara, in France, Norway, Germany, Scotland, and last, but not least, in England and Wales. Its uses are so manifold that space would not permit of their enumeration. The electrician has found that for overhead transmission lines aluminium presents an alternative to copper, offering equal conductance at 40 per cent. less cost, and a lighter pole construction. Bus-bars, electrical accessories, and, to a certain extent, insulated wires, previously made of copper, are now being replaced by aluminium with economical results. The motor-car industry utilises this metal for gear-cases, radiators, and crank chambers. Various Governments, particularly the French, Russian and Japanese, are availing themselves of its lightness and durability, to equip their troops with aluminium accoutrements, reducing the weight of the kit by at least 50 per cent. The replacing of copper coins by aluminium is under serious consideration by various Mints, and some Governments have already taken steps in this direction. On railways and steamships we are becoming accustomed to aluminium railings, gates and fittings. In lithography, calico printing, and photography its uses are being discovered by engravers. In the domestic service, the list of articles such

Fig. 1.—The Aluminium Works, Dolgarrog.

Fig. 2.—Leet from Lake Eigiau to the Service Reservoir.

Fig. 3.—Lake Eigiau, the Main Source of Water Power.

Fig. 4.—The Dam at Lake Eigiau, under Construction.

Fig. 5.—Cutting at Lake Eigiau.

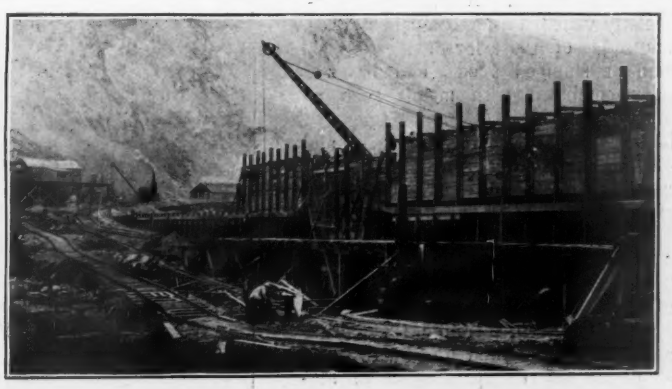


Fig. 6.—The Dam at Lake Eigiau.

Fig. 7.—Getting the Pipes into Position.

in the neighbourhood of 800,000 tons per annum; it may be confidently expected that in the near future aluminium will rank equally in importance.

The Aluminium Corporation, Ltd., was formed in April, 1907, with a nominal capital of £500,000, and offices at 54, Parliament Street, Westminster, S.W. The construction of the first works for the production of aluminium in North Wales was at once commenced. A water-power scheme was adopted, under the superintendence of Messrs. Harper Bros. & Co. and Messrs. Kincaid, Waller, Manville and Dawson, of London, utilising the power available at Dolgarrog, near Tal-y-Cafn, seven miles up the valley from the historic town of Conway. The civil engineering work rendered necessary included the building of a dam at Lake Eigiau and another at Lake Cowlyd for the purpose of increasing the storage capacity of the system. Two leets were constructed respectively from intakes on the rivers Porthlwyd and Ddu to a service reservoir, from which a steel pipe line was conducted from the hillside for a distance of about 3,600 ft., and giving a maximum head of water of about 1,006 ft., to the power station adjacent to the works. The dam, which is about $\frac{3}{4}$ mile long, is 4 miles distant from the power house. The normal level of the lake was 1,219 ft., ordnance datum. In order to increase the storage and facilitate the getting of stones, gravel and sand, the lake was tapped to a depth of 5 ft. below normal level by a trench running from the lake to the adjacent stream, 650 ft. long by 4ft. wide (fig. 5), and the works are now provided with a storage of 160,000,000 cb. ft. of water, derived from a watershed $14\frac{1}{4}$ square miles in extent. The leets from the river have a capacity of 3,500 cb. ft. of water per minute, and five flood overflows, four of 10 ft. width on the Cowlyd leet and one of 40 ft. width

Fig. 8.—View of Pipe Line.

Fig. 9.—Entrance of 20,000-Volt Transmission Line to the Works.

as chairs, castors, lavatory fittings, stair rods, cooking utensils and the like is apparently endless. The uses of the metal do not finish with its direct applications. Aluminium is particularly valuable as a component of a long series of alloys for castings, rolled, spun or stamped goods, and bronzes, being combined with metals such as copper, zinc, nickel, and tungsten. It is used extensively in iron and steel works as a reducing agent in refining cast-iron, steel and other metals, and prevents the foaming and frothing which impede the flow of metal, reduces the "wasters," produces solid castings free from blow-holes, and renders them more suitable for machining.

It will be seen, therefore, that in describing a modern and up-to-date series of plants for the production of aluminium we are not dealing with any by-product of modern science, but are summarising progress in an industry which is likely to be one of the most important developments of modern history. The world's production of copper is at present

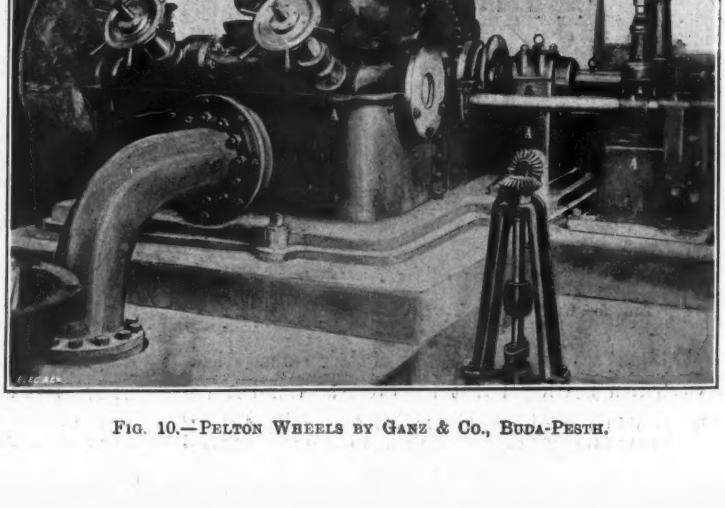


Fig. 10.—Pelton Wheels by Ganz & Co., Buda-Pesth.

on the Eigiau leet, were provided for storm water. The work involved a considerable amount of tunnelling, excavation, road diversion and the building of retaining walls and dams, owing to the exceedingly difficult contours of the country, as shown by the general view of the leet in fig. 2, and Messrs. Bott & Stennett, Ltd., of Westminster, the main contractors for the works at Dolgarrog, are to be complimented upon the expeditious and

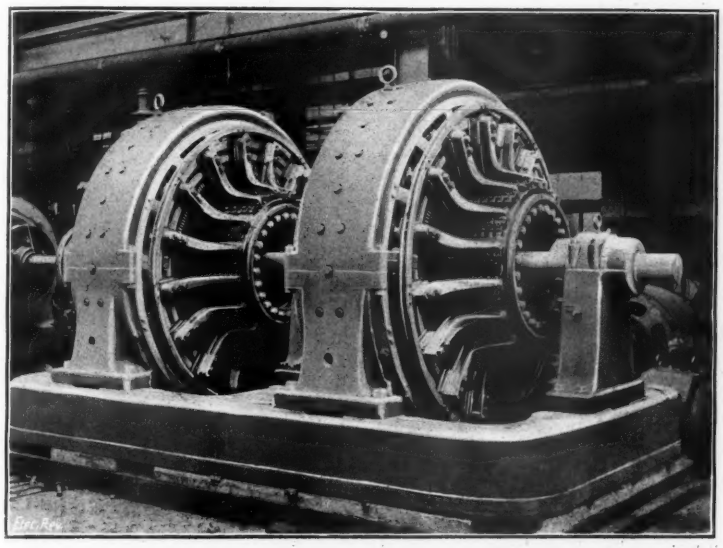


Fig. 11.—Bruce Peebles Turbo-Driven Generators, Dolgarrog; Commutator End.

first-class manner in which they surmounted the difficulties that faced them. Some idea of what these were may be gained from the fact that even the five locomotives used by the contractors on the dam and leets had to be hauled up the incline of 1 in 1·3, down which the pipe line now travels. Five miles of temporary railway track were laid, and it took a full year to get material into position ready to commence work.

The pipe line (fig. 8), of lap-welded steel in the lower lengths and of Kimberley joint in the upper sections, is of 36 in. internal diameter. Concrete blocks 2 ft. 6 in. by 5 ft. are spaced at intervals of about 13 ft. apart for foundations for the pipes, except where curved and straight junctions occur, extra heavy foundations being used at such points. Where the pipe projects into the service reservoir it is provided with a bell-mouth containing a screen. A complete telephone installation provides communication between the power house, the service reservoir, the intake on Lake Eigiau, and a portable telephone call station, the line running along the pipe line and the leets.

At the Dolgarrog works there is a detached set of office buildings, which are closely adjacent to the main block. The power station (fig. 1, p. 803), which was built by Messrs. Edward Wood & Co., of Manchester, contains four Pelton wheel turbines driving Bruce Peebles direct-current generators, each of 1,000 KW. capacity (provision being made for one spare set), and two 600-KW. motor-generators. The total length of the power station is about 125 ft., and it has a clear width of 36 ft. Immediately behind the power house in the same structure, but separated from it by a wall, are six bays, five of which contain the aluminium furnaces, while the remaining bay is devoted to the recasting of aluminium ingots into the various forms required by commerce, and to storage purposes. This furnace house was constructed by Messrs. Francis, Morton & Co., of Garston. There is a total of 125 aluminium furnaces in these works, whose aggregate capacity is about 1,600 tons of metal per annum. The arrangement of the system is practically identical with that of the Wallsend Works, to be described later, with the exception that at Dolgarrog no attempt is made to turn out anything but aluminium, whereas the company at its later works has introduced further electrolytic processes.

Turning for a moment to the power house equipment at Dolgarrog, a trench is formed below floor level on the outside of the longitudinal wall to contain the main water pipe, from which a branch is taken to each turbine set. Before entering the turbines the water passes through a system of six Ganz filters in parallel, fixed on each turbine inlet, and so placed that any filter can be removed for cleaning while the machine is in operation. The outlets from the Pelton wheels are so constructed that the water passes directly downwards to the tail race, and this is provided with weirs at the points where the water is discharged from the turbines, so that there is always water at these points of sufficient depth to act as a cushion to the discharge. The tail race is also protected against destruction caused by jets of water impinging on its walls, by means of cast-iron plates. The Pelton wheels, made by Messrs. Ganz and Co., of Buda-Pesth, who were selected on account of their large previous experience in this class of work, are particularly fine pieces of engineering; our illustration (fig. 11) shows one of these machines with the top cover removed. Every care is taken in the workmanship to secure the absence of end-thrust on the bearings. The regulation of the water is effected by handwheels controlling the inlet jets, while provision is made against racing on a sudden removal of load by deflecting the nozzles through the action of the governor.

The continuous nature of the work imposed on the electrical plant by the requirements of the electro-thermal process rendered it necessary to build the dynamos in accordance with very stringent conditions. In the first place, precautions had to be taken against the unfavourable climatic conditions; for the greater part of the year it rains heavily, and the atmosphere in consequence is extremely damp. The four dynamos have to run day and night at their full rated capacity of 8,000 amperes. At starting, the pressure is gradually raised from 0 to 40 volts, when the furnaces are switched in. Between 40 and

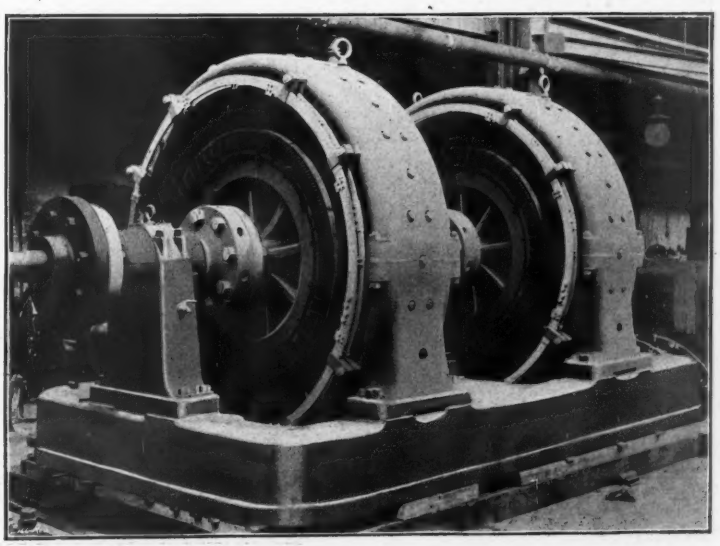


Fig. 12.—Bruce Peebles Generators, Dolgarrog; Coupling End.

138 volts the regulation has to be so fine that the pressure can be raised volt by volt. The normal pressure of the dynamos when running at 450 R.P.M. is 125 volts, but the machines, even when hot, can give a pressure of 138 volts with a current of 8,000 amperes each for one hour. Moreover, they can give any current between 0 and 8,000 amperes at any pressure between 0 and 138 volts, with absolutely sparkless commutation, after 24 hours' run on full load. The armature coils are of electrolytic copper, former wound, and without joints except at the ends, where they are riveted and soldered on to the commutator lugs, which are of laminated copper. Equalising rings are provided to balance any difference of voltage in the sections, and the brush gear is of very massive construction.

The arrangement of Messrs. Bruce Peebles & Co., Ltd., of Edinburgh, who supplied these sets, together with two 600-KW. motor-generators for transforming a high-pressure three-phase supply to direct current on the works, is to couple two dynamos in tandem to the turbines, each pair being mounted on a combination bedplate provided with three water-cooled bearings. Figs. 11 and 12 show these machines admirably. The motor-generators each consist of a 1,000-H.P. induction motor, with liquid starter, coupled to two 300-KW. continuous-current generators, one at either end of the motor. The speed of each set is 375 R.P.M., and each dynamo gives a normal output of 8,000 amperes at any voltage from 25 to 75, or even higher if necessary. The motors are supplied with current at a pressure of 1,050 volts and 50 cycles from Berry transformers. Their general appearance is shown in fig. 13. The balancing of the load between the two machines on each set, both turbine and motor driven, is accomplished by means of special field regulating resistances of Ferranti design mounted near each set. The hand-wheels of these rheostats are so placed that an attendant can balance speedily and easily by operating both at once. Two regulators, two ammeters, and a summation ammeter are provided in each equipment.

Six switchboards are provided in the station, one for each dynamo, consisting of slate panels, carrying a voltmeter and its switch, an ammeter of 9,000 amperes range, an exciter circuit rheostat with a range equivalent to a voltage variation from 0 to 140 by fine gradations, and a bracket carrying a lamp. Each dynamo is connected by cables and aluminium conductors to its set of furnaces, three-way connecting links being included in the circuit, by means of which four different arrangements of circuit may be made. The generator may be connected straight through to its respective furnace; it may be connected to the positive and negative bus-bars of the "hospital bars" with the furnace isolated; the furnace may be connected to the bus-bars with the generator isolated, or, finally, both generator and furnace may be isolated from the bars. The rolled aluminium conductors between the generators and furnaces consist of bars 4 in. by ½ in. cross-section spaced ¼ in. apart, and supported on earthenware insulators placed on channel iron bridges let into the trenches nearly 2 ft. above the floor of the trenches. Copper is only used from the terminals of the dynamos to the aluminium conductors in the generator pits, and the beautiful precision of the wiring work is an object lesson which might well be studied by central-station engineers. The lighting and heating of the power house and works is provided by a 50-H.P. Pelton wheel made by Messrs. Carrick and Ritchie, of Glasgow, directly driving a dynamo of 125 V. and 30 KW. capacity. The nozzle of the wheel is fitted with a regulating spear operated by a centrifugal governor, which prevents the wheel exceeding 10 per cent. above normal full speed under any variation of load. It is a curious feature of these works, caused by the fact that electricity is here actually cheaper than coal, that electric heating, and even cooking, is in practical operation. For effecting maintenance repairs an overhead travelling crane of 12 tons capacity and 36 ft. span, and having a lifting range of 20 ft., is provided in the power house.

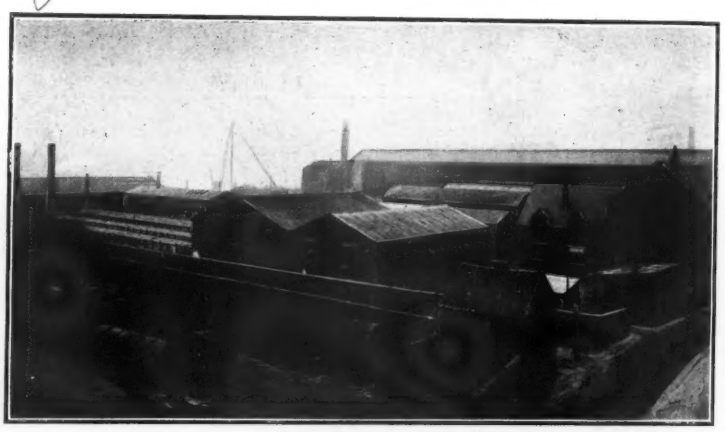


FIG. 14.—GENERAL VIEW OF CARBON WORKS, WALLSEND.

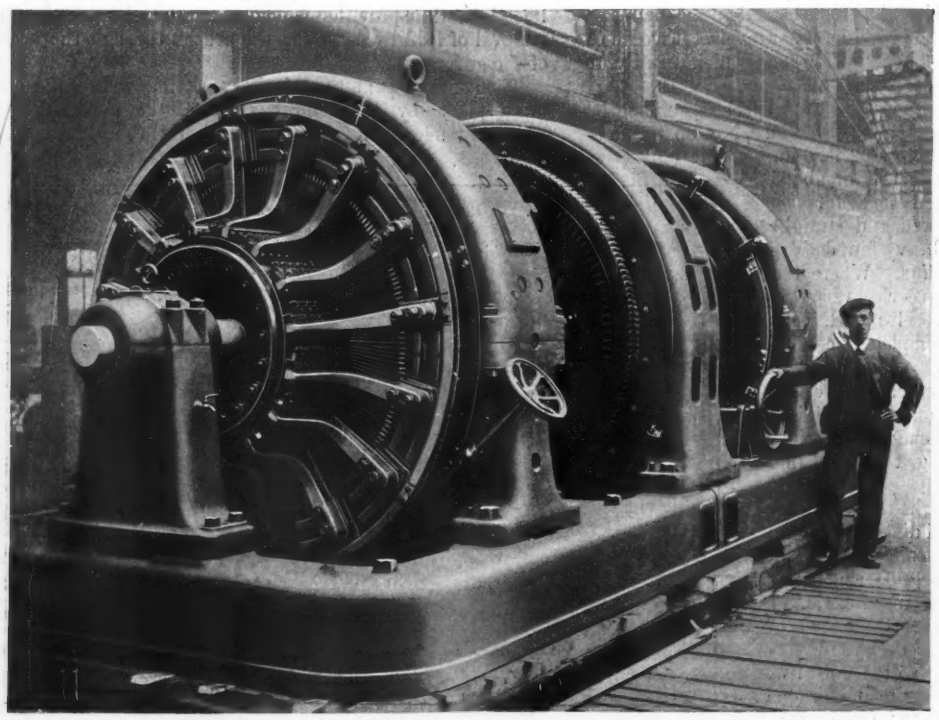


FIG. 13.—BRUCE PEEBLES MOTOR-GENERATOR, DOLGARROG.

Supplementing this very completely equipped power house, an additional supply is provided by means of an overhead transmission line some 12 miles long over wild moorland from the North Wales Power Co.'s generating station at Snowdon. This line, which is capable of transmitting 1,200 KW. at a pressure of 20,000 volts, is of the type illustrated in fig. 9, showing the entrance to the power house, and terminates in two step-down transformers of 1,000 kilo-volt-ampere capacity of the water-cooled oil-insulated type, made by the British Electric Transformer Co., Ltd.

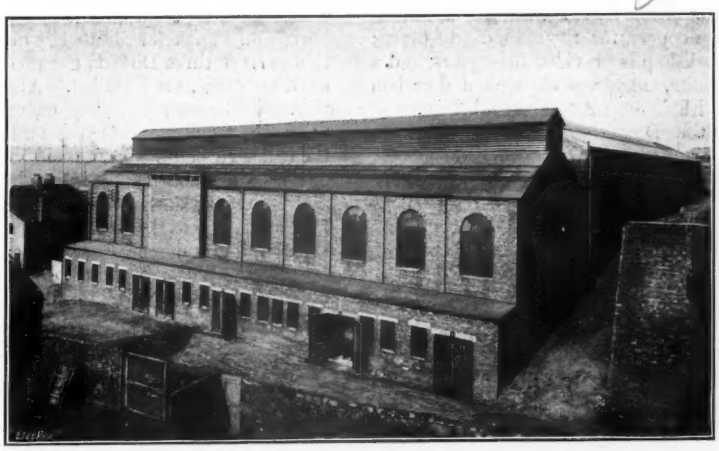


FIG. 15.—EXTERNAL VIEW OF SUB-STATION, WALLSEND, AND ALUMINIUM FURNACE ROOM AT THE REAR.

The extra-high-pressure switchgear, lightning arresters, &c., are contained in a special chamber built at one side of the power house, the line entering the building by means of a marble panel furnished with porcelain insulators and mica tubes to withstand the working pressure. The lightning arresters are of the cylinder type, with a running-water earth, and are surmounted by spark-gaps, choke coils, and isolating switches at the top. The main bus-bars to the transformers are placed at the top of slate chambers, and above each cellular Ferranti oil switch is placed an isolating switch mounted on triple-petticoated insulators. A feature of the design is the excellent means adopted to earth every metallic portion of the construction which is not intended to be under pressure. The nine oil-break switches, each in its own chamber, are operated from a switchboard in the power house by means of Ferranti three-pole automatic cut-out oil-break switches equipped with free handles, so that the existence of a short-circuit or earth will cause the circuit to be broken independently of any pressure on the handle. Time-limit relays are also provided. A rather remarkable transformer forms part of the equipment, capable of converting directly from 20,000 volts to 105 volts, and having a capacity of 30 KW. This is for the purpose of giving a stand-by supply for the lighting and motor circuits. The 1,000-volt, or low-pressure circuits of the main transformers, are conducted to a portion of the transformer room separated off by expanded metal screens, and containing switchgear whereby the two secondaries of the main transformers may be paralleled if required. Isolating links are also provided for cutting out a transformer for overhauling. The low-pressure side of the main transformers is connected to the two 600-KW. motor-generators, each comprising two 4,000-ampere generators connected in parallel, previously mentioned.

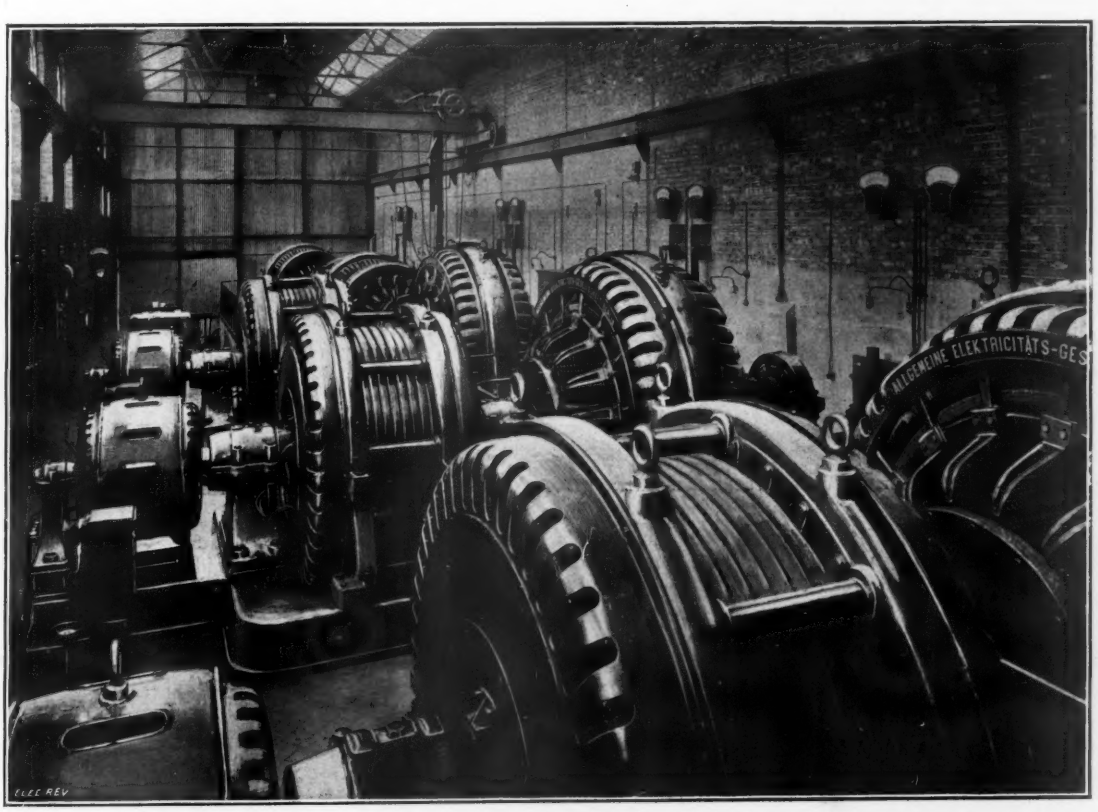


FIG. 16.—INTERIOR OF WALLSEND SUB-STATION; A E.G. MOTOR-GENERATORS IN THE FOREGROUND.

The presence of these high-pressure conductors near the telephone lines renders precaution necessary, not only against contact, but also against static inductive effects. For this reason the telephone connections in the power house

consist of highly-insulated wires, and the instrument is protected by high-pressure fuses and disconnecting links. Anyone speaking has to stand on an insulating stool, and the mouth and ear piece are not in metallic connection with the line, but are separated therefrom by an insulated pneumatic system.

The yard lighting is carried out by Beck flame arc lamps fed by overhead aluminium cable circuits, these cables being 50 per cent. cheaper than copper for the same conductance; an electrically-driven workshop is provided for repairs, and a store for aluminium, cryolite, anhydrous alumina, and carbon electrodes is furnished with a 1-ton Avery weighbridge.

It is possible that the Dolgarrog works would have attained more than their present importance had not the company received from the district of Newcastle-upon-Tyne such favourable proposals and terms for electric power supply that it was decided to erect a second plant at Wallsend, not far from the Carville generating station of the Newcastle-upon-Tyne Electric Supply Co., Ltd. An area of about 3½ acres adjacent to the water front of the river was taken and cleared of existing buildings, the foundations of the aluminium works and of a plant for the manufacture of carbon electrodes being laid in August, 1907. The work proceeded with such speed that at the end of February of the present year the carbon works were in full operation, while the first metal was run from the aluminium furnaces on March 11th.

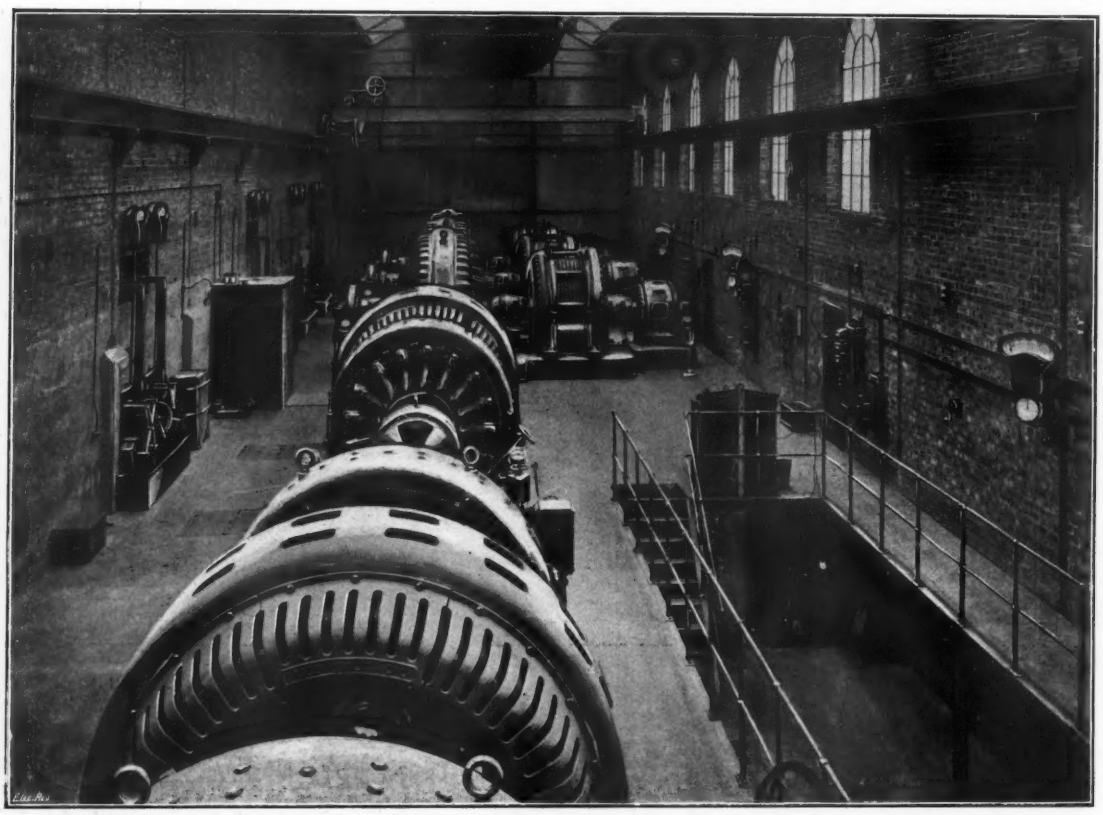


Fig. 17.—Interior of Wallsend Sub-Station; Bruce Peebles Motor-Generators in the Foreground.

In order to obtain an idea of the process employed, it is necessary to start with the carbon works, where the electrodes to be afterwards used in the furnaces are made. The raw materials used are oil coke, retort carbon and pitch. These are brought to the works by water, and are placed in a store adjacent to the wharf, capable of holding 200 tons of coke. The oil coke is first calcined and then, together with the retort carbon, is passed through crushing machinery, and reduced to a fine powder. This is then taken to mixers and incorporated with heated pitch in a liquid condition, afterwards being placed under hydraulic pressure of 1 ton per square inch, and pressed into carbon blocks. The mixing machines and rams were made by Messrs. Wilson & Sons, of Johnstone, N.B. The opportunity is taken in this process of inserting the iron bar which is to form the contact of the electrode in the furnace. These blocks of carbon, measuring approximately 10 in. × 10 in. × 12 in., are then placed in batches on trucks 6 ft. long and put into carbonising furnaces, through which the trucks are gradually pushed forward by means of hydraulic rams, one truck pushing another, till the complete passage has been made, taking a week or ten days. The furnaces are three in number, each of about 4 to 5 tons capacity per day, and are each 190 ft. long, in the form of a horizontal kiln or flue, heated by means of producer gas. For this purpose three Dowson gas producers, with the necessary auxiliary plant, are installed. After the trucks have passed through the furnaces they emerge into a cooling room, where the trucks are cooled down to a reasonable extent, and the baked carbon blocks are taken off and stored. Provision has been made to manufacture electrodes up to 5 ft. long, and powerful plant is installed for the purpose.

The carbon works are, however, simply a preparation for the aluminium manufacture, the electrodes being made here for both the Wallsend and the Dolgarrog works. The modern manufacture of aluminium depends upon the electrolytic separation at a temperature of 900° C. or 1,000° C. of a bath consisting of aluminium oxide or alumina (Al_2O_3) dissolved in cryolite, a double fluoride of sodium and aluminium ($Al_2Fl_6 . 6NaFl.$). The alumina is at present obtained by the Aluminium Corporation in the open market; but before very long refined bauxite will be prepared by their associated company, the Bauxite Refining Co., Ltd., of Hebburn-on-Tyne, reference to whose operations will be made immediately. Electric power is obtained from the Newcastle-upon-Tyne Electric Supply Co., Ltd., to the extent of 4,000 KW., the supply being brought direct from Carville at 6,000 volts to British Thomson-Houston high-pressure switchgear at the sub-station on the works; a single unit system of feeding to the machines has been adhered to, with provision for coupling the feeders across in the sub-station. This sub-station is arranged with reference to the furnace room precisely as at Dolgarrog. Four bays in the furnace room, which are 133 ft. wide and 160 ft. long, stand at right angles to, and are separated by a wall from, the power station, where are installed the motor-generators. The capacity of the aluminium furnaces installed is about 1,000 tons of metallic

aluminium per annum. In addition to this, furnaces are now erected for the manufacture of ferro-alloys such as ferro-chrome of various grades, ferro-silicon, &c., and also

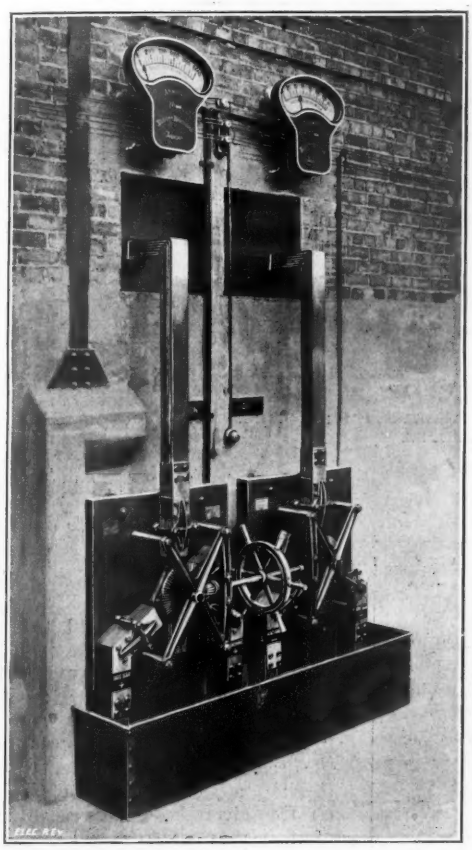


Fig. 18.—British Thomson-Houston Three-Way Switch, 8,000 Amperes Capacity, on Furnace Circuit.

electric steel. These lend themselves especially well to the electro-chemical operations of the firm, and the furnaces now being built are more powerful than the aluminium furnaces, the power required for each varying from 400 H.P. to 1,200 H.P. The furnace room and power house stand on rising ground, so a lift has been installed for the transport of material to and from the furnace room.

The exterior of the Wallsend substation, with the furnace room at the back, is illustrated in fig. 15, while the interior is shown by figs. 16 and 17, giving the appearance of the room from opposite ends. The main equipment consists of three motor-generators made by the Allgemeine Elektricitäts-Gesellschaft, of Berlin, and two motor-generators of the Bruce Peebles design. Each set is constructed to have 1,000 KW. capacity, and they are connected, in precisely the same way as at Dolgarrog, to the furnaces or hospital bus-bars by means of three-way B.T.-H. switches of the type shown in fig. 18. The three A.E.G. machines each consist of a synchronous three-phase motor coupled direct to a shunt-wound 16-pole direct-current generator, having two windings on the armature connected to separate commutators. Each winding is capable of giving continuously 4,000 amperes at any pressure from 15 to 100 volts in 2-volt gradations, and from 100 to 130 by 1-volt steps, when the set is running at 300 R.P.M. Commutating poles in series with the main current are provided to eliminate sparking, and the output is balanced, if necessary, between the two halves of the armature by moving the separate rockers, an ammeter being included in each armature circuit for the purpose of balancing. A notable feature of the design is the extreme rigidity of the collector gear. The number of brushes per machine is no less than 480. To support the weight of the field casting, a screw-jack bearing is placed at the centre underneath the machine, as well as the ordinary side frame bearings.

The motors are ventilated by means of fan-blades fixed on rings on the outside of the rotor, and spaces are left in the field stampings for the egress of air, the machine thus acting as a radial flow turbine. An air gap of 8 mm. between rotor and stator is all that is allowed, the sets, which are mounted on combination bedplates, being fitted with self-aligning bearings. Some idea of the size of the machines may be gained from the fact that the dynamo field weighs 9·2 tons; the armature weighs 12·5 tons, while the rotor of the motor weighs 9 tons and the stator 8·3 tons. It was impossible to get the parts in by road owing to their size, so that a special sheer-legs had to be used to transport the parts through a neighbouring engineering yard.

At one end of each shaft is coupled a three-phase starting motor, these being supplied through a 500-KW. A.E.G. transformer and a Reyrolle ironclad switch panel. The motors are capable of developing 200 H.P. each for short periods, and have a synchronous speed of 380 volts. They are of the slip-ring type, and synchronisation of the main machines is effected by varying the water resistance in series with the starting-motor rotors. At the other end of the shaft of each set is an overhung exciter. The low-pressure windings of the sets had all to withstand an alternating pressure test of 1,000 volts, while the high-pressure windings were tested to 12,000 volts.

In the running tests, the machines came out well; the average temperature rise was 36° C. on the motors and 38° C. on the generators. The machines had to give 25 per cent. overload at 125 volts for two hours, 50 per cent. for 10 minutes, and 100 per cent. momentarily. Moreover, the provisions of the specifications were that a limit of 11 per cent. rise of voltage when all load was switched off was to be allowed; the actual figure was 7·5 per cent. The average full-load efficiency of the sets, shown in fig. 16, is 87 per cent.

The Bruce Peebles sets are very similar to those installed at Dolgarrog; each set consists of a 1,500-H.P. synchronous motor, driving at each end a 500-KW. continuous-current generator. On an extension of one generator shaft is

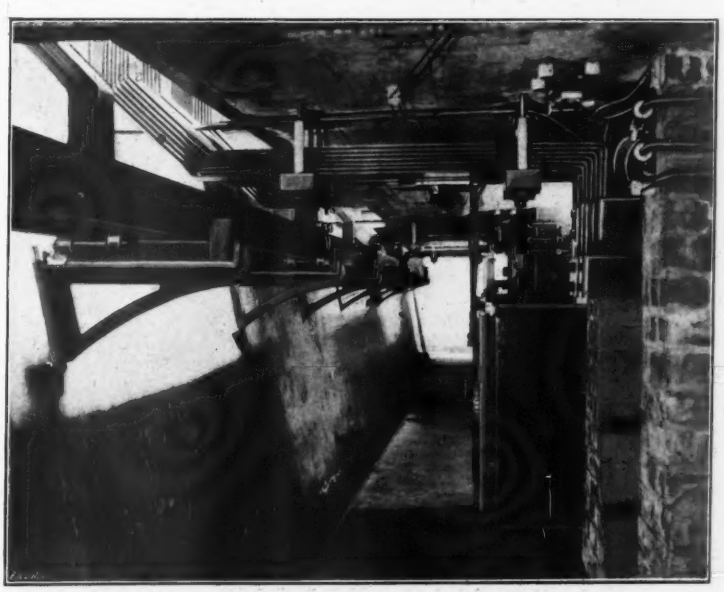


Fig. 19.—Part of Furnace Circuit, Showing B.T.-H. Gear.

mounted the starting motor, and at the opposite end an exciter. The speed of the combined plant is 400 R.P.M., the exciters being used for exciting not only the synchronous motor, but also the continuous-current machines. Similar

balancing boards to those at Dolgarrog, previously described, are installed in connection with these sets. The circuits to the furnace room are precisely as in the sister establishment.

After the metal has been run out of the furnaces into moulds in the form of crude product ingots, these are passed to the stores; afterwards they are taken to the recasting shop, where they are cast into the various market products, such as large bars in various sizes, billets for drawing into wire or rolling into rods, and tube billets for drawing into tubes. These special forms are made up as the order comes along, stock being usually kept in the form of ingots. The recasting and alloy room contains three furnaces of special design, two being rotating furnaces with natural draught, fired by producer gas, and the other being a tilting furnace by the Morgan Crucible Co., Ltd., for alloys, the blast being obtained by a motor-driven fan. All classes of aluminium alloys are here produced for casting, rolling and general work, including aluminium bronze. Two of the most useful of the series are the Aluminium Corporation's "D Alloy" and "F Alloy." The former is an aluminium zinc and copper alloy, giving a white casting metal that flows well and gives clean, sharp castings. It is used for motor fittings that have to be machined, and is especially good in sand or chilled moulds. The latter is a copper aluminium alloy much used for motor and cycle castings, being capable of bending and riveting cold.

Fig. 20.—Bauxite Mine of the Aluminium Corporation, Ltd.; Preliminary Mining Works at St. Barnabe.

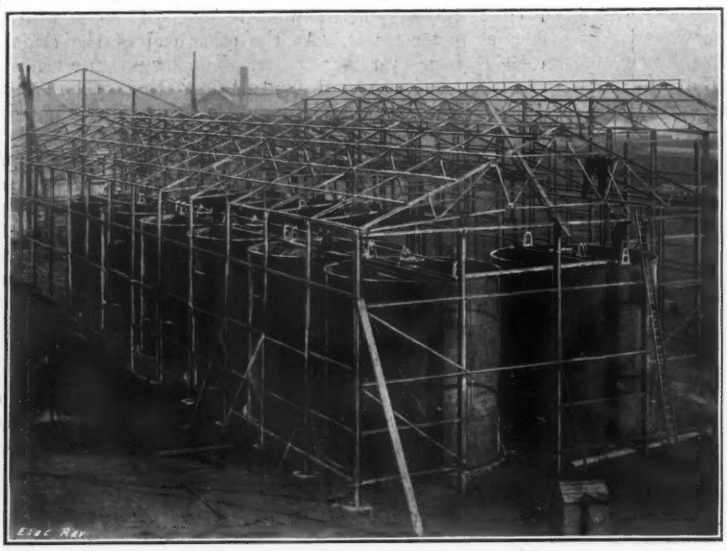


Fig. 21.—Erecting the Hebburn Works; Filter Presses and Constructional Work.

At the Wallsend works is situated the chemical laboratory in which samples of all raw and finished materials handled by the Corporation are tested. It is equipped with muffle furnaces, chemical testing appliances and all necessary apparatus for testing the oil coke, alumina, baked carbons and the various metals. Every day's samples of the finished aluminium and its alloys are checked for purity, these being derived both from Wallsend and Dolgarrog, and the aluminium produced is of a very high quality, in no case falling below 99 per cent. of the pure metal.

The transport of raw material and finished products, both at Dolgarrog and at Wallsend, is chiefly accomplished by water. At the North Wales works powers have been obtained to bridge the river and to connect to a railway running down the opposite bank of the Conway. An alternative scheme is to effect transport by means of flat-bottomed steam hoppers from the sea. At Wallsend ample water facilities are obtained, the works being on the riverside. Alternative means of transport are, or will be, available in both places; at Dolgarrog a steam motor-wagon service connects the works with the Conway Railway station and harbour, while at Wallsend a railway siding is in process of construction. The chief markets to which the aluminium is shipped are abroad, and this, in view of tariff restrictions, is an encouraging indication for this English industry.

Reference has been made to the fact that the Aluminium Corporation is about to obtain its alumina from the associated firm at Hebburn. The works of the

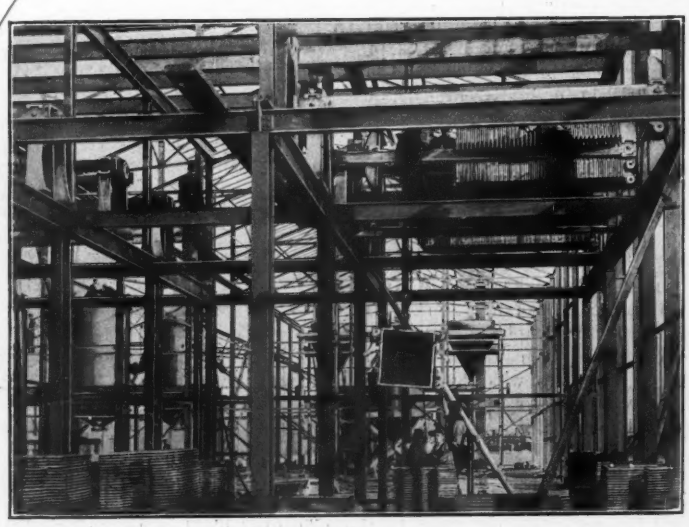


Fig. 22.—Portion of the Hebburn Works Nearing Completion.

Bauxite Refining Co., Ltd., which are just nearing completion, will be capable of turning out from 4,000 to 6,000 tons of alumina or refined bauxite per year, but are being designed so that their output can be doubled when required. The strategic importance of this will be realised when it is remembered that, a year or two ago, aluminium was selling at £180 per ton; now it has fallen to £70. It is therefore important to secure a supply of refined bauxite at the lowest possible rates. The Aluminium Corporation have achieved this by obtaining valuable properties in the Var district, in the South of France, where the best quality of bauxite, containing about 62 per cent. of alumina and a very low proportion of silica, is found. They have at present in operation two bauxite shafts at St. Barnabe, near Sillans, the preliminary mining works for which are shown in fig. 20. About 50 French and Italian workmen are employed in mining the bauxite, which is then shipped to Toulon and thence to the Hebburn works. The special advantage of this arrangement is that cargoes of coal are already in great demand in the Mediterranean, and the colliers bring back the bauxite practically as ballast. It is therefore expected that the cost of production of alumina will be reduced below previous figures by the Hebburn works, because of the advantageous position and up-to-date plant employed.

The erection of the works, which occupy about one acre of a total ground area of close upon five acres, was begun on July 18th, 1908, and its progress is being so vigorously pushed forward that in a very short time Tyneside alumina will be an accomplished fact. The buildings, supplied by Messrs. Brownlie & Murray, Ltd., of Glasgow, consist of a furnace-house bay 230 ft. long, together with two other bays of galvanised iron superstructure on a concrete foundation, devoted to the wet portion of the process. A store is in process of erection, which will be capable of holding 2,000 tons of bauxite and keeping it dry. The raw material is brought to this store by means of a full-gauge railway track, either from the North-Eastern Railway or from the closely adjacent river Tyne. From the store the crude bauxite passes to the crushing house, where it is reduced to the fineness of flour. A motor-driven pneumatic separator plant both grinds and winnows the material, at the rate of 40 tons per day; this plant was made by Messrs. Ernest Newell & Co., Ltd. The ground material is then mixed with caustic soda, obtained from the neighbouring works of the United Alkali Co., Ltd., and the mixture is lifted to a series of "kiers," or double-jacketed boilers, where the heat of steam in the outer jacket boils the liquor within. This arrangement is necessary to avoid dilution of the caustic soda. After a number of hours' boiling it is blown into elevated tanks, and goes through an elaborate filtration process in a series of presses. The aluminate of soda which has been formed, being in a state of solution, passes through, while the suspended oxide of iron is rejected. A market for this by-product is now being developed, and this will constitute an advance in the economical production of aluminium which has not hitherto been obtained.

The aluminate of soda, after a second filtration, is brought up to such a state of purity that it is found in a subsequent stage that the amount of impurity in the hydrate of alumina is of the order of ·001 per cent. After this filtration the aluminate of soda passes to a series of large tanks, each capable of treating upwards of 45,000 gallons of liquid. These tanks have large internal agitators electrically driven through two lines of shafting seen in fig. 22, and aluminium hydrate separates out and is drawn off to a third set of filters. The residue in the tanks, or "mother liquid," is the caustic soda, and so is the filtrate obtained from the third filtration.

The precipitate, however, is alumina in the form $Al_2O_3H_2O$. An electrically-driven air compressor blows air through this mass at a pressure of 8 lb. per sq. in., and drives off the mechanically-contained water. The hydrate of alumina is calcined in the furnace house, a water-sealed gas producer being utilised to heat the furnaces, and the refined Al_2O_3 is then ready for transport to Wallsend or Dolgarrog.

It is, however, necessary to note the economical working of the plant as evidenced in the treatment of the caustic soda or "mother liquid." This is passed back from the filters and large tanks to a series of evaporators for concentration, built by Messrs. Ernest Scott & Co., Ltd., of London. These consist of four large pans, 9 ft. in diameter, containing a series of tubes, through which the liquor passes and outside which steam plays. These are arranged so as to have a multiple effect. In the first pan exhaust steam at about 10 lb. pressure is used; the last of the series is subjected to a vacuum caused by a pump connected to a barometric condenser, and the vapour evolved from one pan boils the liquid in the pan next to it in such a way that it is possible to evaporate 2 lb. of water for every pound of steam originally used. Moreover, the condensed water goes to feed the battery of boilers generating steam at 120 lb. per square inch for heating purposes and for generating electric power and lighting on the works. The heating is largely done by exhaust steam, the engines acting as a reducing valve.

Thus the Aluminium Corporation, Ltd., who hold five-sixths of the capital of the Bauxite Refining Co., Ltd., have caustic soda at their own doors; they have cheap coal, cheap electricity, cheap transit, and their own bauxite. They ought to be able to supply aluminium at a price which will be unassailable by competitors.

It will probably have occurred to our readers that in describing the operations of this group of works we have really been typifying some of the achievements of electro-chemistry which will make the earlier decade of the twentieth century memorable as a period of intense industrial development. The example that we have now before us is especially valuable as exemplifying modern practice in electrical engineering in connection with chemical and metallurgical industries, and we have to thank Mr. R. S. Downe, the general manager of the Aluminium Corporation, Ltd., together with his staff officers, Mr. E. F. Jones, of Dolgarrog, Mr. T. L. Kolkin, of Wallsend, and Mr. H. T. Fletcher, of Hebburn, for their courtesy in allowing us to make a detailed study of these three works, and affording us every facility for investigation.

CONTRACTORS' COLUMN.

(*Concluded from page* 802.)

EGHAM.—Presbytery at St. Cuthbert's Church, Englefield Green; and stables at Broomlea. Mr. Norris, builder, Sunningdale, Egham.

ELLESMERE PORT.—Proposed town hall and Council offices, for the U.D.C. (£7,900). New library for the U.D.C.; Sproat & Warwick, architects, 18, Cook Street, Liverpool.

ENFIELD.—Girls' secondary school and technical institute at Holly Walk.

EPSOM.—Further extensions to Manor Asylum (£15,978). W. C. Clifford Smith, engineer, Asylums Committee L.C.C., 6, Waterloo Place, S.W.

FARNBOROUGH.—New Conservative Club premises in Camp Road. W. E. Trevena, architect.

GATESHEAD.—Proposed new Lunatic Asylum at Stannington, near Gateshead. Borough Engineer, Gateshead.

GELLIGAER.—Additions to Council School. T. Mansel Franklin, clerk to the Glamorgan C.C., Cardiff.

GILLINGHAM.—Proposed swimming bath for the T.C. (£1,000). Houses, Twydall Lane, for Kemp Bros.; Napier Road, for C. H. Langley, builder, 66, Gillingham Road, The Green; Barnsole Road, for J. R. Featherby; E. J. Hammond, architect, 21, Balmoral Road, Gillingham. Bungalow, Hempstead, for Mr. Pharoah; H. H. Dunstall, architect, Bank Chambers, Railway Street, Chatham. Naval wards for the hospital, to be lit by electricity, for the T.C.

GLASGOW.—New Pavilion Hospital, at York Hill; Alan E. Clapperton, secretary for the Royal Hospital for Sick Children, Glasgow. Ten cottages, Aird's Road; Andrew Kerr, Craigmore, Giffnock, Glasgow. Three tenements, Kilmarnock Road; M. Farlane and Co., builders, Giffnock. Extension for Dead Meat Market for Glasgow Corporation; the City Engineer, City Chambers. Four tenements in Batson Street; George Eadie, builder, 405, Mathieson Street. Twelve terrace houses in Compsie Street, for Springburn Garden City Co., 205, Hope Street. School and other buildings in Hopehill Road, for Directors of Houses of Refuge, Reformatories, &c.; Thos. M'Harg, secretary, 60, Buchanan Street.

GRANGEMOUTH.—Dwelling-houses in Ronaldshay Crescent; Mr. Wilson (Wilson & Tait), architect, Grangemouth. Alterations to Baltic Tavern and Burn's Bar.

GRAVESEND.—Shop and eight houses, Campbell Road, for W. Hine. Twelve houses, Campbell Road, for Jacobsen & Timson; Bridgland and Clay, architects.

GUISELEY.—Extension of the parish church. Nicholson & Corlette, architects, 2, New Square, Lincoln's Inn, London, W.C.

HANLEY.—Additions to house, 17, Grove Place, H. Watson; additions to premises, Wood Terrace, F. Swinnerton & Son; carriage repository, King Street, E. Haughton.

HELEN'S BAY (Co. Down).—Detached villa. J. V. Brennan, architect, Belfast Bank Chambers, Belfast.

HENDY (Carmarthen).—New school for 300 children, for the C.C.

HEYBRIDGE (near Maldon).—New schools for 400 children, for Essex E.C.

HOUNSLOW.—Bakehouse and six houses, Wellington Road. D. L. Gooch, surveyor, 54, Gresham Street, E.C.

HURSLEY (Hants).—Houses, Castle Lane, for Mr. Jackson; Chandler's Ford, for Mr. Hedges.

HYTHE.—Shop and café in High Street, for F. Austin; two houses, Fort Road, for Mrs. Hammond.

ILFORD.—Four houses, Haslemere Road; M. A. Haines, builder, 241, Plashet Road, E. Store and workshop for F. C. Moor, painter and decorator, 185, Wanstead Park Road, Ilford. Four houses, Mortlake Road; D. W. Lucas, builder, 64, Markhouse Road, Walthamstow, N.E.

INVERURIE.—New bakery. George Gray, architect, Inverurie.

ISLEWORTH.—Church hall, Spring Grove. J. E. Franck, architect, 11, Pancras Lane, E.C.

KETTERING.—New board room and master's house, for the B.G. Gotch and Saunders, architects, High Street, Kettering.

KIRKCALDY.—New church in Millie Street. Free Church Minister, Kirkcaldy.

LANCASTER.—Dwelling-house in Westbourne Grove; J. F. Morgan. Two dwelling-houses in High Caton Road; C. Gibson. Warehouse in Back Moorgate; John Cottam. Eight dwelling-houses, in Sibsey Street; N. Grubb, builder.

LEAMINGTON.—New chapel at the Royal Midland Counties Home for Incurables. W. Hawley Lloyd, architect.

LEICESTER.—Firemen's cottages for the T.C. (£1,559).

LICHFIELD.—Extensions to schools at Hammerwich, for the Staffs. C.C, (£1,080). Thos. Mason & Son, builders, Rugeley.

LINCOLN.—Municipal water scheme (Elkesley, near Retford). A. C. Potter and Co., contractors, Lant Street, Borough, London.

LIVERPOOL.—Prospective rebuilding, after fire, of premises, for G. Howson and Co., Ltd., ship repairers and contractors, Regent Road, Liverpool.

LLANDAFF (Glam.).—Proposed new school for 250 scholars, for the C.C.

LLANGADOCK.—House at Abermarlais Park. D. T. M. Jones, solicitor, Llandovery.

LLANGAN (Bridgend).—Extensive alterations to Rectory. G. E. Halliday architect, 19, Castle Street, Cardiff.

LONDON (Poplar, E.).—Building, 23-27, Wade Street; F. G. Paul, builder, 86, Palmerston Road, Walthamstow, N.E. School (£12,948), Dingle Lane; J. & C. Bowyer, Ltd., builders, Upper Norwood, S.E.

(Streatham, S.W.)—Ten houses and stables, Penwortham Road. Swain & Selley, builders, Furzedown Farm, Streatham.

(Putney, S.W.).—Motor house, Upper Richmond Road. H. J. Hawkins, builder, 381, Upper Richmond Road, Putney.

(Hornsey, N.).—Six houses, Hornsey Lane Gardens; J. C. Hill, 14, Archway Road, N.W. Eight houses, Oak Avenue; C. W. Boswell, 6, Redstone Road.

(Highgate, N.).—Three houses, Stanhope Gardens; F. Collins, builder, 17, Stanhope Road. Additions to Barnesfield, Bishopswood Road; Southcott & Co., builders, 20, Southwood Lane.

(Marylebone, W.).—Improving and enlarging Barrow Hill Road School (£14,973). G. E. Wallis & Sons, Ltd., builders, 1, Albemarle Street, W.

(East Ham, E.).—Residence at hospital for Medical Officer. A. H. Campbell, surveyor to Town Council.

(Mile End, E.).—School in Carter Street (£3,111). F. & T. Thorne, builders, Isle of Dogs, E.

(Leyton, N.E.).—Refreshment pavilion, &c., at playing grounds; W. Dawson, surveyor to the Urban District Council. Extension of office accommodation at Town Hall (£8,600); W. Dawson, surveyor, Town Hall, Leyton. Two shop fronts, store, &c., Hoe Street; J. W. Dunford, architect, 100c, Queen Victoria Street, E.C.

(Buckingham Gate, S.W.).—Additions Wellington House Hotel. Palgrave & Co., architects, 28, Victoria Street, S.W.

(Wimbledon, S.W.).—Empire Theatre of Varieties, Hartfield Road. T. V. Woodhouse, architect, 16, Hound Street, West Bridgeford, Nottingham.

(Finchley, N.).—Six houses, Chamberlain Road; Pilgrim and Pilgrim, builders, 6, Boston Place, Dorset Square, N.W. Five shops and dwelling houses, Woodhouse Road; E. F. Day, builder, 21, Regent's Park, Finchley. Seven houses, Eton Avenue and Granville Road; J. Ellwood, architect, 50, Prince's Avenue, Church End, Finchley.

(City Road, E.C.).—Premises for German Y.M.C.A. (£12,600); G. Waymouth, architect, 32, Theobald's Road, W.C.; Whitehead and Co., builders, 12, Little Trinity Lane, E.C.

(Crouch End, N.).—Six houses, Berkeley Road. F. Cotterell, 118, Crouch Hill.

(Muswell Hill, N.).—Fourteen houses, Connaught Gardens. Eyles, Lewis and Co., agents, 85, Gresham Street, E.C.

(Wandsworth, S.W.).—Drying room at Holland House Laundry, Burmester Road, Springfield, for W. Piper. Stables and messroom, Anglo-American Laundry, Burmester Road, Springfield; Holliday & Greenwood, builders, 144a, Loughborough Park, Brixton.

(Clapham, S.W.).—Billiard hall, High Street, Clapham (South), for Temperance Billiard Halls, Ltd.

(Balham, S.W.).—Workshops at rear of 223, Balham High Road, for Heavers Executors.

(Whitechapel, E.).—Alterations to Empire Hall, Fieldgate Street. S. Wollrauch, surveyor, 47, Leadenhall Street, E.C.

(Bermondsey, S.E.).—Parish hall in connection with St. Luke's Church. H. J. Williams, builder, 49, Bonham Road, S.W.

(Greenwich, S.E.).—Addition to mortuary at Seamen's Hospital; Holliday & Greenwood, builders, 144a, Loughborough Park, Brixton. Warehouse, C. & A. Robinson's Wharf, Marlborough Street; F. J. Gorham, builder, Point Hill, S.E. Additions (140 places) St. John's Church of England School, Russell Place; the Managers. Enlargement (£650) of Blackheath, Lee, Lewisham and Greenwich School of Art; Secretary of Committee. Addition to Greenwich Inlaid Linoleum Works, Blackwall Lane; Wm. Downs, builder, Hampton Street, Walworth, S.E. Buildings in King William Street; Edgar Banks, builder, 255, High Street, Lewisham, S.E.

(Limehouse, E.).—School (£6,257), Farrance Street. T. D. Leng, builder, Evelyn Street, Deptford, S.E.

(Poplar, E.).—Educational Divisional Offices. T. J. Bailey, Education architect to L.C.C, Victoria Embankment.

(North Camberwell, S.E.).—Enlarging "Oliver Goldsmith" school (£5,768); J. and C Bowyer, Ltd., builders, Upper Norwood, S.E. Enlarging Gloucester Road school (£1,549); J. and C. Bowyer, Ltd., builders, Upper Norwood, S.E.

(Paddington, W.).—Extension of Technical Institution. T. J. Bailey (Education), architect to L.C.C., Victoria Embankment.

(Notting Hill, W.).—Adaptation of premises in High Street for branch of London City and Midland Bank, 5, Threadneedle Street, E.C.

(Hammersmith, W.).—Rebuilding of business premises, 189 and 197, King Street, for J. C. Platt, house furnisher.

(E.C.).—Subways for pedestrians, from Queen Victoria Street to Blackfriars Bridge (£9,867). Perry & Co., contractors, Tredegar Works, Bow, E.

(W.).—Building on site of 132-136, Oxford Street. Walter Wallis, Ltd., builders, Balham, S.W.

LONDON (Lewisham, S.E.).—Additions to Nos. 34 and 36, Stanstead Road. S. Ford, architect, 3, South Square, Gray's Inn, W.C.

(Tooting, S.W.).—Concert Hall in Tooting High Street (seat 1,500). Emden, Egan & Co., architects, 2, Lancaster Place, Strand, W.C.

(Hampstead, N.W.).—Additions to No. 2, Eton Avenue. A. F. Faulkner, architect, 2, Sloane Gardens, Chelsea, S.W.

(Islington, N.).—Shop, 326, Caledonian Road; Lovegrove and Papworth, architects, 170, High Street, Shoreditch, N.E.

(Dulwich, S.E.).—House in Townley Road; W. S. Smith, builder, 67, Denmark Hill, S.E. New Street from Herne Hill Road to Dane Avenue; R. Ellis & Son, contractors, 56, Lavender Hill, Battersea, S.W.

(Westminster, S.W.).—Extension of Trevelyan Hall, St. Ann's Lane. H. S. Rogers, architect, 7, Dean's Yard, Westminster, S.W.

(Norwood, S.E.).—Tramcar shed for the L.C.C. (£24,374). Chas. Wall, Ltd., builders, Lloyd's Avenue, E.C.

(Woolwich, S.E.).—Additions to shop, 17, Plumstead Common Road; A. H. Hutton, architect, 25, Chestnut Road, Plumstead, S.E. Thames Tunnel for pedestrians under consideration by the L.C.C. (£112,000).

(Piccadilly Circus, W.).—Alterations to the London Pavilion. Wylson & Long, architects, 16, King William Street, Strand, W.C.

(Kilburn, N.W.)—Limelight rooms at the Vaudeville Theatre, High Road. W. G. R. Sprague, architect, 10 and 11, Jermyn Street, S.W.

(Brixton, S.W.).—Alterations to Empress Theatre. B. Crewe, architect, 3 and 4, Savoy Mansions, W.C.

(Norbury, S.W.).—Sixty-three cottages for the L.C.C. (£11,600). Gathercole Bros., builders, Norbury, S.W.

(St. Pancras, N.W.).—Proposed central sessions house at Hunter Street. W. E. Riley, superintendent architect, L.C.C.

LONGTON.—Extension of Edensor Works, Edensor Road, T. C. Wild; extension of premises, Normacot Road, J. Goodwin; alteration to premises, Trentham Road, R. Bennett.

LURGAN.—Market buildings for the T.C. F. W. Pollock, Town Clerk.

LYNTON.—Roman Catholic Church and Convent, and priest's residence. Leonard Stokes, architect, 2, Great Smith Street, Westminster, London; B. Jones, builder, Lynton.

MAIDENHEAD.—Houses: Belmont Road, for F. W. Singer; King's Grove Road, for J. H. Barford. Secondary school and house, for Berks C.C. (£7,212); Messrs. Seward, builders, Wokingham.

MAESTEG.—Two semi-detached villas at Neath Road. F. B. Smith, architect, Port Talbot.

MANCHESTER.—Alterations and additions to the tramway depôt, Hyde Road, Ardwick, for the T.C. J. M. M'Elroy, general manager, Tramways Department, 55, Piccadilly, Manchester.

(Hulme).—Probable re-erection (after fire) of venetian blind factory, for Beale, Coulson & Co., Crown Street.

MANSFIELD.—Proposed new Baptist Church (£3,500). Rev. H. Nichols, pastor.

MANSFIELD WOODHOUSE.—Cemetery chapel, caretaker's house, &c., for the U.D.C. F. P. Cock, architect, Leeming Street, Mansfield.

MARGATE.—Shop, Northdown Road; Reeve & Reeve, architects, Margate. Houses, Dane Hill Row; F. J. Doughty, builder, New Street, Margate. Victoria Avenue, for F. Ward; alterations to St. George's Boarding House, Lewis Avenue, for G. A. Cleveland.

MARKET DRAYTON.—New secondary school for Salop C.C. Joseph Holt, architect, 9, Albert Square, Manchester.

MARLOW.—Extension of premises for Smith & Co., High Street. C. Hooper and Nash, architects, High Street, Marlow.

MATLOCK BATH.—Kursaal for the U.D.C. (£7,000). F. W. A. Hodge, London, and J. Nuttall, Crown Square, Matlock, joint architects.

MAXWELLTOWN (N.B.)—Glove factory at Ryedale, for W. Tyler & Co., glove manufacturers, Leicester.

MORECAMBE.—House, South Avenue, for A. W. Gorton, South Road.

NANTWICH.—Alterations and additions to the Police Station for Cheshire C.C. H. Beswick, architect, Newgate Street, Chester.

NEATH.—New school at Tonmawr, and alterations, &c., at the Intermediate School; clerk to the Glamorgan C.C., Cardiff.

NEW BRIGHTON.—Row of houses in Vaughan Road. Jas. Bellis, builder, Liscard, Cheshire.

NEWCASTLE-UNDER-LYME.—New hall residence at Standon, for Sir Thos. Salt.

NEWPORT (Mon.).—Development of Somerton Garden Suburb Estate, for T. E. Watson, J.P. Newland, Davis & Hunt, architects, Newport (Mon.).

NEW SHILDON (Co. Durham).—Thirteen houses, Dale Terrace, for T. G. Henderson.

NORTHAMPTON.—Isolation hospital at Berrywood Asylum. C. A. Markham, clerk to the Visiting Committee, 1, Guildhall Road, Northampton.

NOTTINGHAM.—Men's Institute at Sherwood; A. E. Heazell, architect, 5, Burton Buildings, Parliament Street, Nottingham. Proposed extensive additions to Bagthorpe Workhouse, for the B.G. (£6,500).

ORMSKIRK.—New church house (£1,600). T. B. Medcalf, architect, 9, Railway Road, Ormskirk.

OXFORD.—Alterations and additions to premises, for John Collier & Sons, cycle and motor dealers, St. Aldate's.

PENCLAWDD.—New infants' school. Clerk to the Glamorgan C.C., Cardiff.

PONTARDAWE.—Proposed erection of houses on the Cilybebill Estate. C. S. Thomas, Meager & Jones, architects, Wind Street, Swansea.

PONTARDULAIS (Glam.).—Additions to Hope Chapel. J. Davies & Son, architects, Cowell House, Llanelly.

PONTYPRIDD.—Residence at Lan Wood, for S. G. Hill; W. M. Lewis and T. N. Morgan, architects, Pontypridd. New schools at Maesycoed (£12,000); T. Mansel Franklin, clerk to the Glamorgan C.C., Council offices, Westgate Street, Cardiff.

PORTSMOUTH.—Reconstruction of warehouse; T. White Co., Commercial Road. Additions to factory, Somers Road North, for Palmer and Sons; J. Durrant. Shop, 23, Osborne Road, for E. Hollanders; Bishop Bros., Osborne Road. Additional business premises, Palmerston Road; Knight & Lee, Palmerston Road. Two additional villas at the Borough Asylum, to be lit by electricity; Rake & Cogswell, architects, Prudential Buildings, Landport, Portsmouth. Extensions to the Nurses' Home, for the B.G.; Rake & Cogswell, architects, Prudential Buildings, Landport, Portsmouth.

PRESCOT.—Mortuary at Whiston Workhouse, for the B.G. Jas. Gandy, architect, Masonic Buildings, St. Helens.

PRESTON.—New schools for the Borough Education Committee (£11,425). The Borough Surveyor.

READING.—Proposed new hall at Earley. School at Hyde End, Shinfield; E. Fisher, architect to the Berks. Education Committee, Blagrave Street, Reading.

RISHTON (Lancs.).—Six houses, Clifton Street, for John Knowles.

ROTHERHAM.—New Primitive Methodist Church at Dalton Brook. Dr. B. Jenkinson, architect, Imperial Buildings, Rotherham.

ROWLEY REGIS.—New boys' school in Doulton Road (310 scholars). Rowley Regis Education Committee.

RUNCORN.—Development of estate at Morris Brook, Grappenhall, by the Warrington Garden Suburb, Ltd.

ST. ASAPH.—New Church House (£1,200). H. S. Stock, chairman of the Building Committee.

SCREMERSTON (near NORHAM, NORTHUMBERLAND).—Proposed development of the Northern Estate of Greenwich Hospital for building residences. C. H. R. Stansfield, Director of Greenwich Hospital, London.

SELBY.—Coal boring operations on the Earl of Londesborough's Estate, near Staynor Wood.

SHEFFIELD.—Lodge and conveniences at Whiteley Woods: City architect, Town Hall, Sheffield. Conversion of Ebenezer Wesleyan Day Schools into institute.

SHIPLEY.—Houses, Moorhead Terrace, for W. L. Woolf; Wensley Avenue, for Wm. Pitts & Sons.

SMETHWICK.—Shops, Uplands, and houses, Beechfield Road, for T. W. Evans; houses, Lewisham Road and Marshall Street, for W. Lees.

SORN (AYRSHIRE).—New Sorn Castle. Thomas W. Macintyre, Kirkmichael House, Ayrshire, proprietor of the Sorn Castle Estate.

SOUTHAMPTON.—Additions, Hookham, Winchester Road; G. R. Long, builder, Bellemoor Road, Shirley, Southampton. Additions, 112, Portswood Road; G. T. Othen, builder, 99, Derby Road, Southampton. Additions, 52, Atherley Road; H. J. Hood, builder, 142, Shirley Road, Freemantle, Southampton. Additions, Portarlington, College Place; A. A. Burnett, architect, 2, High Street, Southampton. Additions and alterations, 135, Hill Lane; A. Warden, builder, Holt Road, Southampton. Eight houses in York, Bullar and Henry Roads; W. H. Masters, architect, 38, Regent Circus, Swindon, Wilts. Eight houses, in Duke's and Charlton Roads; Jurd & Sanders, architects, 23, Portland Street, Southampton. Workmen's houses (£3,300); J. A. Crowther, borough engineer. Adapting premises, 48, Payne's Road, for Police Station (£960); J. A. Crowther, borough engineer.

STAPLEFORD (NOTTS.).—Proposed erection of 50 to 100 houses, Monbridge Lane. Mr. Hooley, architect, Imperial Buildings, Long Eaton.

STEVENAGE.—Houses, Stanmore Road, for Geo. Davy, junr.

STOKE.—New Sunday Schools, Victoria Road; Trustees, St. Paul's Church, Stoke. Conversion of Borough Arms, High Street, into shops, &c.; G. Fleet & Co.

SUNNINGDALE (BERKS.).—Mansion on the Golf Links. Mr. Hughes, builder, Wokingham.

SUTTON-ON-SEA (LINCS.).—Water supply scheme for the North-East Lincs. Waterworks Co. F. Smith & Son, engineers, Grimsby.

SWINDON.—Houses, Hunter's Grove; Tydeman Bros., builders, Edgware Road.

SWINTON (LANCS.).—Proposed electric lighting of Trinity Congregational Church; Trustees. New schools near Swinton Station, for Swinton and Pendlebury U.D.C.

TAMWORTH.—School extensions at Wigginton (£1,575). Thos. Watton and Sons, builders, Tamworth.

TONBRIDGE.—Extensive premises for Messrs. Stagg, High Street. Brown and Barrow, architects, Amberley House, Norfolk Street, London, W.C.; Punnett & Sons, builders, Kinnings Row, Tonbridge.

TREFRIW (CARNARVONSHIRE).—Improving ventilation and installation of the electric light in Ebenezer Chapel.

TREHARRIS (GLAM.).—Housing scheme contemplated. Co-operative Society.

TRELEWIS.—Additions to Council School. Clerk to the Glamorgan C.C., Cardiff.

TUNSTALL.—Sludge-pressing plant and premises for the U.D.C. A. R. Wood, surveyor, Town Hall, Tunstall.

UXBRIDGE.—Proposed elementary school (300 scholars). Middlesex Education Committee.

WALLASEY.—Proposed Masonic Hall, Manor Road, Liscard (£2,000).

WALLINGFORD.—Boys' school (£3,429); Bosher & Sons, builders, Cholsey.

WALTHAM ST. LAWRENCE (BERKS.).—School for the Berks. Education Committee (£3,320). Bosher & Sons, builders, Cholsey.

WALTON-ON-THE-NAZE.—Two villas, Naze Park Road, for Sir John H. Johnson.

WATFORD.—Co-operative stores (£1,100); C. P. Ayres, architect, 6, The Parade, High Street, Watford; Clark Bros., builders, Fearnley Street, Watford.

WEST BROMWICH.—New Church of the Good Shepherd at Spon Lane (£4,000). Wood & Kendrick, architects, 315, High Street, West Bromwich.

WEST RIDING.—Seventeen new schools for the C.C. (£100,000).

WIGAN.—New Council School at Reech Hill. Director of Education, Wigan.

WINCHESTER.—House, St. Giles' Hill. Cancellor & Hill, architects, 12, Jewry Street, Winchester.

WREXHAM.—New theatre (£12,000). Thos. Price, architect, 77A, Lord Street, Liverpool.

WRIGHTINGTON.—New Council school. County Architect, Preston.

YSTRADMYNACH.—New school. Clerk to the Glamorgan C.C., Cardiff.

THE ELECTRICAL ENGINEERS

(LONDON DIVISION).

The following orders are issued:—

Monday, Nov. 9th.—"A" Company. Technical drill, 6.30 to 9.30 p.m.

Tuesday, Nov. 10th.—"B" Company. Technical drill, 6.30 to 9.30 p.m.

Thursday, Nov. 5th.—"C" Company. Infantry drill (Recruits), 6 to 7 p.m. technical drill, 7 to 10 p.m.

Friday, Nov. 13th.—"D" Company. Technical drill, 6.30 to 9.30 p.m.

Tuesday, Nov. 10th.—Medical inspection for recruits, 6 to 7.30 p.m.

(Signed) J. H. S. PHILLIPS,
Capt. and Acting Adjutant.

Social.—The employés of the Paisley District Tramways Co. held their opening concert and social at Elderslie Depôt on Tuesday, 27th ult. Mr. Fred Coutts, general manager, intimated during the evening that Mr. James Coates, jun., of Fergusie, had given a donation of £50 towards the funds of the Tramwaymen's Pipe Band.

FORTHCOMING EVENTS.

To-day's Events (Friday, November 6th).—At 7.30 p.m. At the Lit. and Phil. Society, Newcastle-on-Tyne. North-East Coast Institution of Engineers and Shipbuilders. Annual meeting.

At 8 p.m. At the Town Hall, Rugby. Rugby Engineering Society. Conversazione.

Monday, November 9th.—At 8 p.m. Institution of Mechanical Engineers (Graduates' Association). Paper on "Railway Fog-Automatic-Signalling," by Mr. L. Hillier.

Tuesday, November 10th.—At 7.30 p.m. At the Municipal School of Technology, Manchester. Institution of Electrical Engineers, Manchester Students' Section. Paper on "Brushgear," by Mr. R. F. Blackmore.

Wednesday, November 11th.—At 7.30 p.m. At the University, Birmingham. Institution of Electrical Engineers (Birmingham Local Section). Paper on "The Testing of Alternators," by Mr. S. P. Smith.

Thursday, November 12th.—At 8 p.m. Institution of Electrical Engineers, London. Opening meeting. Presentation of awards. Inaugural address by Mr. W. M. Mordey.

Friday, November 13th.—At 8 p.m. Borough Polytechnic Institute, Borough Road, S.E. Opening of the "Edric" Hall and new workshops by Earl Carrington.

Saturday, November 14th.—At 8 p.m. At the White Bear Hotel, Dale Street, Liverpool. Liverpool and District Electrical Association; smoking concert, to which all electrical or mechanical engineers are cordially invited, free.

Monday, November 16th.—At 8 p.m. Engineering Lecture Room, Armstrong College, Newcastle-on-Tyne. Institution of Electrical Engineers. Address by president of Section, Mr. A. L. E. Drummond.

Wednesday, November 18th.—At 8 p.m. Royal Society of Arts. Opening meeting, session 1908-9. Address by Sir William White, K.C.B.

Friday, November 20th.—At 8 p.m. At the Institution House. Institution of Mechanical Engineers. Papers on "The Resistance of Metals to Impact," by Messrs. T. E. Stanton and L. Barstow, and "Different Methods of Impact Testing on Notched Bars," by Mr. F. W. Harbord.

NOTES.

A New Zealand Fire Alarm Installation.—Last week a large fire-alarm equipment was shipped to New Zealand by the May, Oatway Co., for the protection of the Government Buildings in Wellington—familiarly known as the big pile—and said to be the largest wooden building in the world. This building was erected in the early days, when earthquakes were feared; the timber of which it is constructed is naturally very dry, and necessitates exceptional measures of protection. For this reason, the detectors will be set to give an alarm upon a rise of 20° F.—an exceedingly low limit. The installation consists of a 100-circuit indicator, a battery of from 12-in. alarm gongs, detectors and other accessories for the Government Buildings; and for the Central Fire Station, a Gamewell register, time-stamp and take-up to work in conjunction with the May-Oatway indicator and distributing board. In the Government Buildings, each of the four floors is divided up into 25 circuits, one circuit running to the suite of rooms occupied by each Minister, the Cabinet Room, the headquarters of the principal officials, &c. The frequency of fire in Colonial Government buildings is rather astonishing when one comes to look into the matter. In August, 1907, a fire occurred in the Transvaal Parliament Buildings, but this was extinguished with practically no danger owing to the timely warning given by the May-Oatway apparatus; not so fortunate were the Parliament Buildings at Wellington, N.Z., which caught fire the same month, but, being unprotected, were burnt out. Within the last week, the Bloemfontein Parliament Buildings have also been burnt out, and they likewise were unprotected.

International Conference on Electrical Units and Standards, 1908.—At the fourth meeting of the Conference on Wednesday, October 21st, the resolutions regarding the watt were adopted, and the working methods recommended for the realisation of the international ohm, ampere and volt were approved; a discussion arose once more over the value to be assigned to the international ampere, but the decision previously arrived at was confirmed, and the value of the E.M.F. of the "Weston Normal Cell" was fixed at 1·0184 volts at 20° C. The institution of an independent international laboratory was also unanimously agreed to, and the Report, which embodied the foregoing matters, was adopted in the amended form published in our last issue. Votes of thanks to Lord Rayleigh, the president, Dr. Glazebrook, chairman of the Technical Committee, and the secretaries, concluded the proceedings. In the afternoon of the same day some of the delegates signed the Report, and a meeting was held on the following day, when the rest of the delegates affixed their signatures to it. Votes of thanks to the Royal Society, to the British Government and to the Board of Trade were passed, and the Conference came to an end.

What is an "Electrician"?—The following has been sent to us as an actual conversation on the telephone of a firm of electrical engineers:—

"Are you there?"

Customer: "I am Mr. —— 's electrician; a customer of ours has been informed that he cannot use a transformer on direct current. Is that so?"

Reply: "That is so."

Customer: "*But* you can burn Osram lamps on direct current, or can't you, or are they (Osram lamps) peculiar to alternating current with transformers?"

The inquiry came from a respectable house which undertakes electrical work.

Institution and Lecture Notes.—Junior Institution of Engineers.—At the last meeting of this Institution a paper, entitled "Some Notes on Hydraulic Machine Tools," was read by Mr. Norman Trusstrum. The author, after claiming that hydraulic methods of metal plate working were, generally speaking, superior to other systems, dealt briefly with questions affecting the materials used in the construction of the machines and the casting of cylinders. The best forms of punches and dies, as determined by experiment, were illustrated. It was shown that, as a general rule, rams were to be preferred to pistons working in cylinders, and the coating of cast-iron plungers, &c., by the electro-deposition of copper, was referred to. In his remarks on the supply of power, the author made reference to the various types of hydraulic hose now obtainable, which would carry heavy pressures, the use of which rendered the machines almost as portable as those actuated electrically. A prolonged discussion followed.

Liverpool and District Electrical Association.—A meeting of this Association was held on October 27th, when an interesting paper was read by Mr. J. J. Richardson, of Liscard, regarding "The Efficiencies of Steam Boilers," which was illustrated by a number of curves.

The Royal Society's Medals.—The following are among the list of Royal Society awards adjudicated by the President and Council:—

The Rumford medal to Prof. H. A. Lorentz, on the ground of his investigations in Optical and Electrical Science.

A Royal medal to Prof. John Milne, on the ground of his pre-eminent services in the modern development of Seismological Science.

The Hughes medal to Prof. Eugen Goldstein, on the ground of his discoveries on the nature of Electric Discharge in Rarefied Gases.

Football Notes.—A match was played at Deptford (Invicta's ground), on Thursday, October 29th, between the L.C.C. Trams F.C. and the Power Station staff. The result was a draw, 3—3.

The Electrical Football League is holding its first annual concert at Robertson's Electric Lamp Works to-morrow (Saturday), November 7th. We are informed that several gentlemen well-known in the electrical world have promised to be present.

Scottish National Exhibition.—The attendance at this Exhibition during its six months' run was 3½ millions, and a surplus of about £15,000 is expected. The show closed on Saturday last, when the Manchester and Franco-British Exhibitions also came to an end.

Litigation.—We learn that the action pending between Thermit, Ltd., and the Brush Co. has been referred to an Official Referee by the Court.

G. H. Shaw & Son v. Boland.—At the Blackburn County Court on October 29th Messrs. G. H. Shaw & Son, electrical engineers, of Town Hall Street, Blackburn, sued John Boland, builder and contractor, for £55 10s. for work done and materials supplied in connection with the installation of electric lighting and bells at three new villas. It was admitted by the plaintiff that Association cable was not used. After several hours' hearing, the Registrar (Mr. J. N. Withers) decided to consult the experts' reports before giving a decision. The Registrar delivered judgment in the case on Monday, finding for the plaintiff for £43.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—A smoker was held at the Tiger Hotel, Pontmorlais, on Friday, October 23rd, 1908, to present Mr. Lewis W. Dixon, managing engineer of the Merthyr Electric Traction and Lighting Co., Ltd., with a mahogany clock with Westminster Chimes, given by the staff and employés on the occasion of his marriage. The ex-Mayor, Mr. Sydney Simons, local solicitor to the company, was in the chair. There were also present Dr. W. W. Jones, medical officer to the company, Mr. C. T. Allan and Mr. R. Roper representing the South Wales Electrical Power Distribution Co., Mr. Noel Evans and Mr. Burr. The presentation was made by Mr. A. J. Howard, chief assistant engineer. Mr. Dixon suitably responded, alluding to the good progress the company was making, and hoping that the year's working would beat all records and show a higher dividend. Mr. Allan, Mr. Cousins, Dr. Jones, Mr. Roper and Mr. Vicary also spoke very highly of the good feeling that prevailed towards Mr. Dixon by all the employés. An excellent programme followed, the arrangements of which had been made by Mr. E. Rowlands.

General.—Mr. William T. Taylor, M.I.E.E., late superintendent and chief engineer, Campania Ind., Mexicana, Mexico, has been appointed electrical engineer to the State of Jammu and Kashmir, India. On December 1st he will take over the scheme originated by Major A. J. de Lotbiniere, C.I.E., R.E., who harnessed the Jhelum River, that is now furnishing power at 60,000 volts to the unique dredging fleet at Baramoola, and the famous silk works at Srinagar.

NEW COMPANIES REGISTERED.

Aero Fire Alarm, Ltd. (100,026).—This company was registered on October 26th, with a capital of £25,000 in £1 shares, to acquire the British rights in an invention or inventions known as Aero Fire Alarm, and the business carried on at 66, Cheapside, E.C., as the Aero Automatic Fire Alarm Co., to adopt an agreement with G. L. Smith and W. Rattray, and to carry on the business of fire alarm and appliance manufacturers, electrical engineers, &c. The subscribers are:—J. Duguid, 57, Crown Street, Aberdeen, 300 shares; W. Youngson, Awden House, Mannofield, Aberdeen, wholesale ironmonger and leather merchant, 300 shares; W. Rattray, Kininvie, Mannofield, manager of Aero Automatic Fire Alarm Co., 300 shares; W. W. White, Southernhay, Fortis Green, N., insurance official, 300 shares; C. F. Tufnell, Watendone Manor, Kenley, Surrey, insurance broker and underwriter, 300 shares; W. H. Weguelin, 66, Cheapside, E.C., surveyor, 1 share; C. E. Cooke, 66, Cheapside, E.C., insurance broker, 1 share. Minimum cash subscription, two-thirds of the shares offered to the public. The first directors (to number not less than four or more than eight) are J. Duguid, W. Rattray, C. F. Tufnell, W. W. White and W. Youngson, each of whom has the right to the allotment of 500 shares at par up to December 31st, 1910; directors' qualification, £300; remuneration as fixed by the company. Registered office, 66, Cheapside, E.C.

Oliver, Clark & Co., Ltd. (99,975).—This company was registered on October 21st, with a capital of £2,500 in £1 shares, to acquire the business of electrical and general engineers, smiths, metal workers, &c., carried on by A. J. Mileson at 20a, Goldhawk Road, Shepherd's Bush, and 24a, St. Mark's Road, North Kensington, W., as "Oliver, Clark & Co." The subscribers (with one share) are:—A. J. Mileson, 88, Melbourn Avenue, West Ealing, provision merchant; C. O. Clark, 20a, Goldhawk Road, W., electrical engineer; T. H. Norman, 5, Balmoral Mansions, East Twickenham, exhibition expert; A. S. Woodhead, Empire Theatre, Shepherd's Bush, W., electrician, Moss' Empires; W. G. Johnson, 358, Acton Lane, Acton, W., electrical engineer; Grace Newson, 20a, Goldhawk Road, Shepherd's Bush, W. Private company: The number of directors is not to be less than two or more than five; the first are C. O. Clark (managing director), A. J. Mileson and W. G. Johnson; qualification, £25; remuneration of ordinary directors as fixed by the company. Registered by Alfred H. Atkins, Ltd., 27-8, Fetter Lane, E.C.

Marryat & McNaught, Ltd. (100,078).—This company was registered on October 29th, with a capital of £5,000 in £1 shares (2,000 preference), to take over the business of an electrical engineer carried on at Askew Villas, Askew Crescent, Shepherd's Bush, W., and to adopt an agreement with H. Marryat and C. J. McNaught. The subscribers (with one share each) are:—H. Marryat, 28, Hatton Garden, E.C., engineer; C. J. McNaught, Annandale, Woodside Park, North Finchley, N., engineer; W. G. McNaught, Annandale, Woodside Park, North Finchley, N., professor of music. Private company. H. Marryat and C. J. McNaught are joint managing directors. Registered office, Askew Works, 31a, Askew Crescent, Shepherd's Bush, W.

E. Goossens, Pope & Co., Ltd. (99,932).—This company was registered on October 19th, with a capital of £1,000 in £1 shares, to acquire the business of electrical lamp manufacturers and merchants carried on by Emile Goossens, F. R. Pope, and M. W. O'Connell, as "E. Goossens, Pope & Co.," and to carry on the same and the business of electricians, electrical engineers, &c. The subscribers (with one share each) are:—F. R. Pope, The Priory, Harlesden Road, N.W., electrical engineer; M. W. O'Connell, 85, Nicoll Road, Harlesden, N.W., electrical engineer. Private company. The number of directors is not to be less than three or more than four; the first are E. Goossens, F. R. Pope, and M. W. O'Connell; qualification, £150. Registered office, 5, Arthur Street, New Oxford Street, W.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Imperial Tramways Co., Ltd. (Bristol) (58,981).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Trust deed dated 1899, securing £300,000 debenture stock.

Smithfield Markets Electric Supply Co., Ltd. (53,354).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Indentures dated 1898 and 1899, securing £54,700.

Newtons, Ltd. (Electrical Engineers, Taunton) (48,936).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Mortgages dated 1905-6, securing £3,500.

Edison & Swan United Electric Light Co., Ltd. (18,984).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Amount £375,615 (no particulars).

CITY NOTES.

Edison & Swan United Electric Light Co., Ltd.

The twenty-fifth ordinary general meeting of the above company was held on October 29th at Winchester House, E.C., under the chairmanship of Mr. Henry Wolfenden.

In moving the adoption of the report (see Electrical Review, October 23rd, page 716), the Chairman said they appeared before

the shareholders that year with a considerably reduced profit as the result of the year's trading as compared with the two previous years, but although such a position was not agreeable either to the board or the shareholders, yet he did not think they need feel dissatisfaction when they came to analyse the cause. They were not by any means the only company in such a position. In the first place, they had had a year of trade depression generally, and in the electrical trade particularly, and this had affected them in common with other firms both in turnover and in the rate of profit earned. In addition they had been specially affected by the increasing use of metal filament lamps. So far the metal-filament lamps had been used to replace carbon lamps, thus decreasing the consumption of the latter, but it would appear to be quite feasible to compensate for this in the future by extending the use of electric light to areas which by reason of the expense had not yet been touched—amongst other directions he might mention small dwelling houses, and, in fact, anywhere where gas hitherto had been used. By this means the metal-filament lamp would prove a blessing in disguise. The consumption of carbon lamps should be maintained practically as hitherto, and the consumption of metal lamps added thereto. They might take it to be certain that carbon lamps would continue to be used on account of their low price in places where only short-hour burning was required, whilst metal-filament lamps would be used where long-hour burning was needed on account of their economy in consumption. Electric light had, undoubtedly, been a luxury, and to democratise its use three factors were necessary, viz. (1) an economical and highly efficient lamp; (2) a cheap form of house installation; and (3) a more simple method of charging for the current supplied. The first they had got without, however, saying that finality had been reached in this direction. The second was in use on the Continent, but the rules of the Fire Insurance Companies did not allow its use in this country. He respectfully suggested that the insurance companies might be approached on the subject with a view to a reconsideration of their rules in this respect. The Institution of Electrical Engineers and other bodies interested in the spread of electric light might approach them. As to what the company was doing, he might say that they were retaining their carbon lamp factories as hitherto, and were adding a new factory for the manufacture of the metal lamp. They were producing such lamps in quantity now, and claimed that they were the first English firm to produce metal lamps upon a commercial scale, and were the largest producers of them in England to-day. They would go on producing in increased quantities. They were giving every satisfaction, and they hoped not only to retain their carbon lamp business, but to add the metal lamp business to it. The lamps were made with British labour and British capital, and he asked British users to support them and enable them to give increased employment to labour in this country. He might mention that they had been awarded a Grand Prize at the Franco-British Exhibition, and were the only firm of lamp-makers upon whom that high honour had been conferred. The whole of the lamps used for outlining the Exhibition buildings were supplied by them. With regard to the accounts, he might say they had been asked why they did not include a profit and loss account, and he might read an extract from the speech of the chairman of the company in 1903, who said: "The expediency of giving the figures of an industrial undertaking to other competitors is somewhat doubtful, and they might with advantage be omitted next year." At each annual meeting the shareholders had acquiesced in their omission, but it was, of course, a matter for the shareholders. They had again reduced their debenture debt during the year by £9,980. With regard to the assets, one of the principal was their holding in the Altrincham Electric Supply, Ltd. The company had again increased the dividend on its shares to 7 per cent., after making full provision for depreciation, and had under consideration the question of supplying power to consumers on a larger scale than had hitherto been done. They looked on this property as an increasingly valuable one. Their works at Ponder's End had been electrified, and more economical working was the result. During the year they had spent £8,147 on capital account, of which £4,757 was for additional buildings, and £3,390 for plant and machinery. On the other hand, they had written off £4,000 as depreciation on the buildings, and £5,000 on machinery and tools, so that practically the new factory was being built out of revenue. Machinery and tools stood in the books at £69,268, being a reduction of £1,609 on previous year's figures, and the rate of depreciation worked out at about 7 per cent. Stocks, £172,454, were up £9,211, which was largely accounted for by the increased amount of work in the engineering side about the time of stock-taking. The investments were taken at cost, but taking the middle Stock Exchange prices on June 30th, they showed a loss of about 8 per cent. The balance brought from profit and loss account was £41,312, which permitted of depreciation of £10,505, reserve £5,000, payment of debenture interest of £16,157, and a dividend on shares amounting to £9,586, leaving £9,606 to be carried forward.

Mr. Ellice Clark seconded the motion.

Mr. F. J. Rogers asked whether the turnover showed an increase or decrease over last year.

Mr. Watson, as a large shareholder, expressed disappointment at the great decrease in their annual profit, and thought the bald statement as to the profit was very inadequate. He also found that the board received £3,000 per annum, which seemed somewhat large when the shareholders only received £9,000. By the articles of association he thought the board were obliged to publish a profit and loss account, and to have five directors. He also felt that the board at present was somewhat of a family party, and it would be an advantage to the shareholders to have some fresh blood, and he would accordingly at the right time propose that Mr. E. I. Murray be elected a director.

Mr. Lea Smith said he had every confidence in the board, for he remembered when he would have had to pay 10s. to get people to take his shares. At the same time he thought the board should disclose more to them. Their shares had dropped from 30s. to 10s., although the dividend was only 1s. less. He would like to know whether the exhibition had resulted in a profit to the company, and further, why the Altrincham Co. did not pay its debt to them if it was so prosperous.

Mr. Balfour, as a £20,000 shareholder, said he would strongly oppose the nomination of Mr. Murray to a seat on the board. He thought it was also dangerous to tell their competitors how their profits were made. They all knew that there had been great competition from the metal-filament lamps, and the company were doing the right thing in manufacturing them themselves.

Mr. Rayment complained of the long time it took for the accounts to be got out. He asked where the reserve fund of £12,500 was?

The Chairman, in reply, said their business extended over a large area, and was detailed, and they could not get the accounts out much quicker. The reserve fund was not invested in any specific way, but was used in the business generally. There had been a falling off in the turnover. He had dealt with the question of profit and loss account in his opening address. They could not hold the board responsible for the fall in the shares. The carbon lamps were used for lighting the Exhibition, but they exhibited the metal lamps on their stall. As to Altrincham accounts, the debt to this company was being liquidated. This year it was reduced by £1,218, whilst the outstanding balance carried interest at 5 per cent. It was not compulsory to have five directors.

The report was then agreed to, and a dividend at the rate of 2½ per cent. on the "A" shares was agreed to.

On the motion for the re-election of the chairman and Sir J. W. Swan as directors, Mr. Watson moved that Mr. Murray be elected as an additional director, but the amendment was defeated, and the retiring directors re-elected.

Cuba Submarine Telegraph Co., Ltd.

The seventy-fourth ordinary general meeting of the above company was held on Wednesday last week at the offices, 58, Old Broad Street, E.C., under the chairmanship of Mr. C. W. Parish.

In moving the adoption of the report (see Electrical Review, October 23rd, page 717), the Chairman said it was the record of a very quiet year. They had had no excitements; there had been no earthquakes in the West Indies, or any other accident to cause a special increase in the traffic, and affairs in Cuba had been very dull. Unfortunately the sugar crop turned out to be a very short one, and this, of course meant less business all round. From time to time he had been able to tell them of improvements in the general condition of the island; the expansion of the sugar industry; increases in the growing of tobacco; fresh departures in the cultivation of fruit, and so forth; but it was not to be expected that progress should be quite continuous, for the climatic conditions of the island were against this. He was inclined to regard last half-year as an enforced period of marking time. The adverse conditions might not occur again at present—and, indeed, there were now hopes that the next sugar crop would be much larger, and with favourable weather and political quietness, considerable improvement in the whole business of the island might be expected. The condition he had referred to explained why there had been a marked falling off in the traffic during the period under review. The revenue account showed £16,352 as traffic receipts, whilst, for the corresponding six months of last year, they were £23,106. This, however, was an unusually large amount, brought about through the heavy increase in the Press and general messages which came after the Jamaica earthquake. In the corresponding period of 1906 the amount was £17,638, or little more than £1,000 above the receipts of the past half-year. The interest on investments and deposits for the six months amounted £1,719, and with the transfer fees they had £18,078 to deal with. This would enable them, after paying working expenses and adding £4,000 to the reserve, to pay the usual preference dividend and to propose an ordinary dividend at the rate of 6 per cent. per annum, free of income-tax, while their carry forward would be £6,756 as against £7,000. Under the circumstances he had alluded to, he thought they might be well satisfied that the half-year's business came out as well as those figures indicated. There was little difference in the expenses. This half-year they had amounted to £6,523, as against £6,571 in the corresponding period. The London expenses were rather more owing to some necessary adjustment of the office staff, while station expenses were rather smaller, and there was a reduced expenditure on the maintenance of lines. As they were all aware, however, there was little variation in their expenses from half-year to half-year. Their claims against the American and the Spanish Governments remained, he was sorry to say, much as they were. They kept working at them with the help of the Foreign Office, and could only hope that their patience and efforts might eventually be rewarded. Their cables had continued to work well, and they had been able to deal with the traffic quickly and accurately, and were wonderfully free from complaints.

Mr. Keith seconded the motion.

Mr. J. R. Murray asked how the traffics for July, August and September had been? He did not know whether in recommending a 6 per cent. dividend the board would have any reason to feel uncomfortable.

The Chairman said they had been a little below the normal, but he thought they would be able to maintain their dividend.

The report was then adopted.

Mr. G. Lyddon, in proposing a vote of thanks to the board and staff, referred to the loyalty of the staff, as was shown by the fact that during the 25 years he had been a shareholder he had never heard a complaint about them.

Mr. H. Benest seconded the motion, which was carried.

The Chairman, in reply, expressed the pleasure the board felt that Mr. Jas. Scott, the secretary, after the illness which kept him away from the last meeting, was back again with them.

Raworth's Traction Patents, Ltd.

There has been sent to us a copy of the speech delivered by the chairman at the general meeting of this company held on October 13th. He stated that work in progress was down from £2,082 to £920. The profit and loss account showed a debit balance transferred to profit and loss. The profit on contracts was £360, against £1,806. They had written off the loss on stock of £525. A further heavy expenditure was incurred during the year on experiments and tests and renewals of patents, which had all been written off against revenue, with the result that the expenses had increased from £1,898 to £3,178. In future many of these expenses would not recur, and the ordinary standing charges had been very materially reduced. Turning to the general aspect of the business, the chairman referred to the action which had been occupying their attention for some time, and he quoted the comments of the Electrical Review (see p. 558, October 2nd, 1908) on the subject. The action made it impossible for the company to obtain any orders until the case was finally disposed of. When it became evident that the case would be dragged on, the staff was reduced and the working offices were removed to Manchester, from which centre the business could be conducted at a greatly reduced cost. The company was now working upon as low a scale of expenses as was consistent with keeping it alive. During the time that had elapsed pending the settlement of the action, a change in the right direction had manifested itself in some of the larger manufacturing companies, and with certain firms of consulting engineers, towards the company. The belief in the possibilities in the use of regenerative control was gradually becoming stronger, and they believed that their system would yet solve the problem. Unfortunately, very little business was being done at present in tramcars, but they had lately succeeded in inducing the Corporation of Rawtenstall, in Lancashire, to adopt the system, after they had made very extensive inquiries and investigations, and having been advised by their engineers, Messrs. Lacey, Sillar & Leigh, that the system was practical and economical. This was the first instance in which the company has had an opportunity of applying the system to all the cars belonging to one corporation, and they looked forward to very excellent results accruing therefrom. The Corporation of Maidstone had placed an order for a demi-car with the avowed object of making it a stepping stone to the general adoption of regenerative control. Exeter and Bradford Corporations were now seriously considering and investigating the system. The requirements at Bradford were very stringent, but they had the co-operation of one of the leading manufacturing electrical firms in the world in meeting those requirements, and their prospects of success were certainly hopeful. The results for the present year (1908) could not by any possibility be satisfactory, and no improved results could be expected until sufficient time had elapsed to obtain and complete new orders. The financial position at the present moment is somewhat strained, and the directors foresee that at an early date it will be necessary to raise further capital on the security of debentures. The hopeful view of the position was:—(1) That the ground was cleared from competition; (2) the increasing interest consulting engineers were taking in regenerative control; (3) the friendly attitude of certain manufacturing companies who had expressed their desire to assist the company. The Westinghouse Co. had undertaken to manufacture everything for the installation at Rawtenstall in their works at Trafford Park, Manchester.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—The report for the half-year ended June 30th, 1908, states that the gross receipts amounted to £290,295, against £304,367 for the corresponding half-year of 1907. The working expenses, including £21,156 for maintenance of cables, absorb £150,889, against £155,930 for the corresponding period of 1907, leaving £139,405. From this is deducted £3,519 for income-tax payable in England, £450 for expenses in connection with International Telegraph Conference in Lisbon, and £15,048 for interest on debenture stock, leaving £120,357 as the net profit for the half-year. After adding £20,389 brought forward, there is an available balance of £140,777. Two quarterly interim dividends of 1½ per cent. each have been paid for the half-year, leaving £65,777 to be carried forward. The cost of the Java-Cocos cable, amounting to £78,944, has been charged against the general reserve fund. The sum of £8,762 has also been debited to the same fund for partial renewals of cables carried out during the past half-year.

Federated Malay States Rubber Co., Ltd. — The report for the year ended May 31st last, presented to the meeting at Antwerp on Wednesday last, stated that the profit for the year amounted to 180.061.15 fr. The directors recommended the payment of a second dividend of 5 per cent., making 8½ per cent. in all for the whole year, carrying forward 6.043,05 fr.

Monte Video Telephone Co., Ltd.

The twentieth annual meeting of the shareholders of this company was held on Friday last at Winchester House, Old Broad Street, Mr. Charles Lock presiding.

The Chairman, in moving the adoption of the report (see Electrical Review, October 30th, page 773), said that the receipts in respect of subscriptions, sales, rentals, &c., had amounted to £39,261, as against £36,054 for the preceding year—a substantial increase which might be taken as an indication of greater activity of business in the city. Unfortunately, however, they had not been able to translate the whole of that gross increase into net increase owing to several causes. First, there had been an increase in the rate of wages paid to their operators, and in order to cope with the increased business they had had to take on additional employés. The second cause had been the occurrence of two rather severe storms last April, which caused a considerable amount of damage. In repairing damage to a telephone system celerity was a great factor, which involved greater expense than if the repairs could be done more leisurely. The two storms might be looked upon as exceptional, and although there was always a certain amount of damage caused by the elements, it was reasonable to expect that for the current year they might not suffer abnormally in that respect. A further cause of increased expenditure was owing to the electrification of the tramway system. Whenever the overhead trolley wires of the tramway came within a certain distance of their telephone wires, a certain amount of induction was set up, which disturbed the service. Of course, it was of the greatest importance that nothing of that kind should occur, and therefore they had no alternative in such cases but to remove the telephone wires which had been affected. Fortunately, they had been able to make an amicable arrangement with the tramway company, who had contributed a portion of the expenses, but, of course, they had had to bear their share. The result of the year was a net profit of £19,400, which, although £983 less than in the previous year, was, he thought, a substantial profit for a company with such a modest capital as theirs. Out of that they had allocated £6,000 to the reserve fund and £5,000 to reserve for renewal of plant, the same as last year. Those reserves were absolutely necessary in the interests of the business, as it was only by making such provisions that they were able to provide the necessary funds required for increasing their connections and wiring up new subscribers. They had also for some time past been trying to obtain permission to lay their lines underground, and their representatives in Monte Video were doing all they could to get the Government to look upon their application favourably. He saw from the *Times* a week or so ago that there was a proposal that the Uruguayan Government should nationalise the service. He hoped, however, that the project would not materialise, but they were in communication with their manager there, and were watching the matter with the greatest attention in the interests of the proprietors. Out of the balance of £19,400 available as profit, they proposed to pay a final dividend of 2½ per cent. on the preference shares, and a further 3 per cent. on the ordinary shares, with which the interim dividends already paid would make 5 per cent. for the year on the preference, and 6 per cent. on the ordinary. In conclusion, the chairman announced that the board had been successful in obtaining the services of Sir John Gavey as consulting engineer, and they looked forward to great assistance from him, both on the technical and practical side of the business.

Mr. J. G. Le Marchant seconded the motion, and the report was adopted.

Electric Supply Corporation, Ltd.

The general meeting of the shareholders of this company was held on Thursday of last week, at Salisbury House, London Wall, Major C. Heaton-Ellis, J.P., in the chair.

In proposing the adoption of the report (see Electrical Review, October 23rd, page 716), the Chairman said it afforded them considerable pleasure to place the report before the shareholders, showing as it did steady progress in the company's business. Last year they reported an increase of 17,974 8-c.p. lamps connected to the company's mains in the various towns. This year the increase in the number of lamps connected was 25,902. At December 31st last, they had the equivalent of 81,554 8-c.p. lamps connected, compared with 55,652 at the end of 1906. Chelmsford, Exmouth, Hitchin, St. Andrews, Dumbarton, and Falmouth, all showed an advance of more than 1,000 lamps. In St. Andrews the increased number was 3,868, in Dumbarton the equivalent of 10,803, and in Falmouth 3,933 lamps. These figures showed remarkable progress in the use and application of electricity in these towns, and this formed a distinctly encouraging sign for the future. With regard to Dumbarton, the increase, viz., 10,803, although given in lamps for comparison, represented principally power load, but it did not include the tramway supply. They looked forward to that station being one of their largest and most important undertakings, having regard to the fact that by the contract with the Dumbarton Burgh and County Tramways Co., they had the right of supplying electric current for working the whole of the tramways handed over to the company, and this would form a very important addition to the output from that station. The working costs of the supply undertakings had increased from £4,499 in 1906, to £7,470 in 1907, an increase of 66 per cent., and in this calculation he had excluded the working costs of Chelmsford and Totnes as they were not included in the 1906 figures. On the other hand (again excluding Chelmsford and Totnes), the revenue had increased from £4,376 in 1906, to £8,494 in 1907, an increase of 94 per cent. The reason for excluding Chelmsford and Totnes was that last year they were separate companies, and the working costs and gross revenue did

not figure in their accounts at all so that for comparison they must exclude them from the figures for 1907. The result of the year's working was that after paying interest on debentures and temporary loans a balance of £401 19s. remained. The chairman at the meeting last year informed them that the provisional order for the Dumbarton Burgh Tramway extensions had been granted and confirmed by Parliament, but that in view of the difficulties of raising capital for their company it had been decided to form a separate company for the Dumbarton tramways. Sanction of Parliament to this having been obtained they had made over to the Dumbarton Burgh and County Tramways the provisional order for the extensions, and the Dumbarton Burgh Tramways as actually constructed by them. They had received as a consideration for this transfer an amount in cash, and they had retained as well a considerable interest in ordinary and preference shares. The tramway company commenced operating their whole system in July last, and he was glad to tell them that the results had fully come up to their expectations. They had already received a half year's dividend on their preference shares, although the entire system had only been in operation for practically three months. They considered this investment in the Dumbarton Burgh and County Tramways an exceedingly satisfactory one, while the amount they received from them for power supply would prove a very substantial addition to their revenue. They were told last year with regard to Hendon that it had been decided to form a separate company to work that undertaking. The Hendon Electric Lighting Co. was duly incorporated in June, 1907, and the necessary capital subscribed. They had secured, by taking a considerable block of shares in the company, what was practically a reversion of the Hendon business, which, from the progress already made and the undoubted prospects of the locality, they considered would be a very profitable one. They were doubtless aware that in the case of an electric supply company the capital account might be said never to be closed, inasmuch as from week to week applications from intending consumers were received, to reach whom it was necessary to incur capital outlay in the laying of mains, and sometimes also in providing new plant. They proposed, therefore, very shortly asking the shareholders to authorise them to increase their borrowing powers. The form in which this additional capital should be raised was receiving the earnest consideration of the directors. Full details would be laid before them very shortly, when they would be called together to give their decision. Meanwhile, notwithstanding the difficulty in raising capital in a time of financial depression they had by dint of hard work, both on the part of the board and of the staff, managed so far satisfactorily to improve their business that the net financial result showed an increase of nearly 100 per cent. in the profits over the amount recorded in 1906. The full dividend at the rate of 5 per cent. per annum had already been paid to the shareholders in respect of the year under review, and the interim dividend up to the end of the first half of the present year, the necessary money having been provided by the auxiliary electrical company under its guarantee. In conclusion, he could only repeat that they considered the business was progressing satisfactorily, that the future was full of promise, and that with the additional capital they would ask for they hoped to secure for the shareholders still better results.

Mr. Ralph T. Hinckes seconded the motion, and the report was adopted.

X Electric Accumulator Co., Ltd.

The report of this company, as quoted in the *Financier*, states that the amount of working capital originally subscribed was insufficient for the company's purposes, although, from the estimate of cost for equipping the factory, it was believed that the balance of working capital available from this first issue, after allowing for the cash consideration of £2,500 payable to the vendor, would be sufficient to enable the company to place its cell upon the market. Under the head of expenditure at the head office the directors call attention to the item of their fees, which appears as £1,010. Of this amount only the sum of £232 has actually been paid, the remainder, £778, being included in the item of sundry creditors shown in the balance-sheet. From December 25th, 1907, the directors have waived all claim to the payment of further fees. Similarly, the amounts shown for law charges and office rent and secretary's salary include unpaid amounts of £1,000 and £400 respectively; these amounts are also included in the entry sundry creditors. These unpaid amounts, aggregating £2,178, form the bulk of the entry sundry creditors. The original patents purchased, which conveyed only an equal interest with another party in the patent rights for Great Britain, were paid for in accordance with the agreement of July 4th, 1905, entered into with the inventor—viz., £2,500 in cash and £22,500 in fully-paid shares. It having been considered advisable to acquire the sole interest in the patent for Great Britain, this was secured by the payment of a further amount of £658 in cash and £4,000 in fully-paid shares. The cost of securing the patent rights in all the principal foreign countries and of patenting certain further improvements of the inventor involved the expenditure of an additional £774. The money available from the first issue for the purposes of manufacturing was exceedingly limited. The directors think it only fair to state that the inventor, Mr. E. L. Opperman, who acted throughout as the managing director, supported his belief in the superior qualities of his cell by devoting £2,000 of the £2,500 which he received in cash as his subscription to the ordinary working capital. The sole asset now held by this company is its 10 per cent. participation in the net profit of a new syndicate, which has acquired the property of the company. The directors deem it desirable to take the necessary steps to voluntarily liquidate the company.

Norwich Electric Tramways Co.

The Hon. A. G. Brand presided on October 30th at the annual meeting of the above company held at 20, Bishopsgate Street Without, E.C. The report showed a decrease of £1,692 in revenue, as compared to the previous year, and an increase of £44 in expenses, making a decrease of £1,736 in profits. The latter figure is, however, arrived at after charging to revenue the following extraordinary expenses:—Arbitration law costs, £1,185; repairs carried out under arbitration, £427; repaving Unthank Road, £643; total, £2,255. There is a further liability (£1,000) in respect of arbitration law costs yet to be dealt with. The passengers carried were 7,190,361, a decrease of 377,845, and the car-miles run were 1,049,175, as against 1,081,221. The amount standing to credit of profit and loss is £6,470, from which £2,640 has to be deducted in respect of 4 per cent. interest on the mortgage bonds, leaving £3,830. £500 has been placed to reserve, and a dividend of 1¼ per cent. (£3,300) is to be paid for the year ended June 30th, £30 being carried forward. The report was adopted, after the chairman had briefly expressed the regret of the board that the profits were not larger. They did their best to serve the city, and the shareholders ought to have received a larger return upon their outlay.

Companies Struck off the Register.—It is announced that the following companies have been struck off the register and are dissolved:—

Cox Thermo-Electric Co., Ltd.
"Holophane," Ltd.
Patent Universal Smoke Condenser Co., Ltd.
Side Pressure Ball Bearings Syndicate, Ltd.
Simplex Electric Tramway Conduit Syndicate.
Standard Dynamo and Motor Manufacturing Co., Ltd.
United Electric Wire and Telegraph Works, Ltd.

Electrolytic Alkali Co., Ltd.—The annual meeting was held on the 30th ult. in Liverpool. Colonel W. L. Pilkington said that the excess of stocks on hand was due to trade depression and postponement of deliveries, but since the accounts were made up stocks had been considerably reduced. Under all the circumstances the result of the year's working must be considered satisfactory. In reply to shareholders, a director stated that while the board was favourable to a combination to maintain prices, the conditions offered were thought to be detrimental to the company, and the negotiations fell through.

Eastern Telegraph Co., Ltd.—The directors' report for the six months ended June 30th, 1908, states that the revenue for the period amounted to £568,443, from which are deducted £208,072 for the ordinary expenses, and £53,099 for expenditure relating to maintenance of cables, depreciation of spare cable, sundry differences in exchange, and income-tax payable abroad, leaving a balance of £307,272, to which is added £35,795 brought from the preceding account, making a total available balance of £343,067. After providing for income-tax payable in England, interest on mortgage debenture stock, and for two quarterly dividends on the preference stock, which in all absorb £82,302, there remains a balance of £260,765, out of which the directors have placed £7,000 to the reserve fund for maintenance ships, £100,000 to the general reserve fund, and have allocated £100,000 to meet the two interim dividends of 1¼ per cent. each on the ordinary stock, the balance of £53,765 being carried forward.

R. & J. Dick, Ltd.—The first annual report states that the gross profit on the year's trading is £63,411, from which interest to vendors, income-tax, and depreciation amounting to £23,286, have to be deducted, leaving £40,125. After paying preference dividend and placing £6,000 to a special preference dividend reserve fund, £15,000 is written off goodwill, a 4 per cent. dividend is declared, and £4,043 is carried forward.

Douglas Southern Electric Tramways, Ltd.—The report states that the season consisted of 115 days, against 125 days last season, and the total receipts were £5,012, as against £5,613, or £600 less. The falling off this year had been due to bad trade and to stormy weather during the greater part of September. The passengers carried were 206,994, as against 231,664 last year. The net profit for the year was £1,479, as against £1,692. Out of a total disposable balance of £1,658 the directors recommend a dividend of 5½ per cent. upon the preference shares, leaving £229 to be carried forward.

Western Telegraph Co., Ltd.—The report for the half-year ended June 30th, 1908, shows a revenue for the period amounting to £353,185 and working expenses to £115,485. After providing £16,000 for debenture stock interest, and £5,241 for income-tax, there remains a balance of £216,469; to this is added the sum of £5,973 brought forward from December 31st last, making a total of £222,432. A quarterly interim dividend, amounting to £31,189 has been paid, £110,000 transferred to the general reserve fund, £5,000 to the maintenance ships' reserves fund, £10,000 to the marine insurance fund, and £10,000 to the land and buildings depreciation fund. The directors now recommend the declaration of a final dividend of 3s. per share, making with the interim dividends, a total dividend of 6 per cent. for the year, also the payment of a bonus of 2s. per share, both free of income-tax, which together will amount to £51,982, leaving a balance of £4,260 to be carried forward. The dividend and bonus will be payable on November 12th.

British Columbia Electric Railway Co., Ltd.—The report for the year ended June 30th, 1908, recommends a dividend of 8 per cent. per annum on the deferred ordinary shares, placing £49,000 to reserve, and carrying forward £4,974. We shall refer further to the report next week.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
Aberdeen	Oct. 28	2,578	+ 54	22	32,962	— 322	14·4	..
Ayr	,, 31	884	+ 7	24	9,014	— 252	8	..
Bath	,, 28	1,407	— 16	43	32,397	— 2,309	13	..
Belfast	,, 30	7,160	— 54	31	112,728	+ 1,400	37	..
Birkenhead	Nov. 1	2,110	— 85	31	33,591	+ 558	13·52	..
Birmingham Corp.	Oct. 24	12,876	+ 243	30	189,725	+ 6,246	56·46	..
†Blackburn	Sept. 2	1,117	— 100	23	27,098	+ 996	14·13	..
Blackpool Corp.	,, 17	3,906	— 889	..	37,578	— 983	11·87	..
,, — Fleetw'd.	Oct. 31	658	+ 71	17	19,477	— 1,868	8·25	..
Bolton	Nov. 1	4,870	— 61	31	73,214	+ 1,234	26	..
Bournemouth	Oct. 28	2,759	— 120	30	58,753	— 2,913	21·72	..
Bradford	,, 31	9,095	+ 236	30	147,456	+ 490	54·9	..
Brighton	Nov. 1	1,595	+ 22	30	30,853	+ 688	9·5	..
Bristol	Oct. 30	9,880	— 31	..	..	..	31	..
Brit. Elec. Trac. Co.								
Airdrie	,, 28	464	— 17	42	9,441	— 9	3·65	..
Barnsley	,, 28	859	+ 28	,,	7,528	+ 418	..	..
Barrow	,, 28	435	— 52	,,	10,558	— 511	5·37	..
Cavehill	,, 28	129	— 11	,,	3,860	+ 157	..	..
Devonport	,, 28	972	— 117	,,	19,783	+ 186	8·85	..
Gateshead	,, 28	2,061	— 6	,,	42,790	+ 155	11·25	..
Gravesend	,, 28	395	— 79	,,	9,096	— 1,450	6·5	..
Greenock	,, 28	990	— 250	,,	22,545	— 5,663	7·25	..
Hartlepool	,, 28	420	— 126	,,	10,278	— 2,184	6·72	..
Kidderminster	,, 28	191	— 13	,,	4,847	— 356	..	..
Leamington	,, 28	421	+ 38	,,	7,405	+ 435	3	..
Merthyr	,, 21	417	— 11	,,	8,982	+ 41	2·9	..
Metropolitan	,, 25	12,274	+2,782	,,	245,441	+46,383	22	..
Middleton	,, 28	630	— 89	,,	15,371	+ 185	8·5	.
Mid. Joint Com'tee	,, 28	11,448	— 532	,,	243,928	— 3,556	..	..
Oldham—Ashton	,, 28	1,116	— 102	,,	25,198	— 577	9·18	..
Peterborough	,, 28	250	— 1	,,	5,539	+ 12	5·31	..
Potteries	,, 28	3 583	— 234	,,	76,370	— 1,900	29	..
Rothesay	,, 28	180	+ 18	,,	9,506	— 504	2·75	..
Southport	,, 28	502	+ 34	,,	12,294	— 790	8·17	..
S. Metropolitan	,, 28	1,690	+ 156	,,	34,875	+ 437	..	..
Swansea	,, 28	1,916	+ 101	,,	40,321	+ 864	12·5	..
Tynemouth	,, 28	345	— 10	,,	10,038	— 787	3·75	..
Weston-s-Mare	,, 21	114	— 8	,,	6,529	— 502	3	..
‡Worcester	,, 28	559	+ 22	,,	12,169	— 73	5·75	..
Wrexham	,, 28	207	+ 1	,,	4,387	— 13	..	..
Yorks. Wool. Dist.	,, 28	1,870	+ 100	,,	39 081	— 782	17	..
Miscellaneous	,, 28	387	— 31	,,	8,915	— 681	..	..
Burnley	,, 31	2,183	— 261	..	..	..	7·5	..
Burton-on-Trent	Nov. 1	531	— 2	31	8,614	— 591	6·5	..
†Bury	Oct. 25	1,043	+ 52	29⅔	86,139	+ 1,922	22·5	..
Cardiff	,, 24	4,128	+ 52	30	66,395	— 107	..	..
Carlisle	,, 31	528	— 18	44	7,767	+ 27	..	..
Chatham and Dist.	,, 29	1,607	+ 283	43	34,206	+ 2,283	14·98	2·82
Cork	,, 29	923	+ 78	43	20,070	— 583	6·89	..
Croydon	,, 23	2,822	+ 65	30	43,578	— 456	11·25	·75
Darlington	,, 31	393	— 22	31	6,200	— 471	..	..
Darwen	,, 30	476	— 37	47	7,872	— 190	4·36	..
Dover	,, 24	378	— 37	30	7,501	— 292	4 75	..
Dublin	,, 30	9,976	—1,907	..	93,595	—27,296	54·25	5·5
Dundee	,, 28	2,306	+ 88	23⅔	29,254	+ 1,569	14·5	..
East Ham	,, 31	1,777	+ 35	31	27,411	— 1,203	8·43	·68
Exeter	,, 30	574	+ 37	31	10,382	— 63	5·5	..
Glasgow	,, 31	34.773	— 993	..	380,553	— 6,476	90·5	1·5
Hastings	,, 29	1,712	— 79	..	..	..	..	..
Huddersfield	,, 31	3,062	— 34	31	50,541	— 140	28·5	·5
Hull	,, 31	4,900	— 18	31	76,451	+ 144	13	..
Ilkeston	,, 28	308	— 18	30	4,443	— 11	3·5	..
Ipswich	,, 31	688	— 1	31	13,012	— 274	10·5	..
Kilmarnock	,, 24	282	— 22	23	3,609	— 234	4·26	..
Lan'kshire Trm. Co.	,, 29	2,688	— 74	43	56,090	+ 3,254	17	1·18
Lancashire United	,, 28	2,474	+ 38	43	58 200	+ 2,364	39	1
Leeds	,, 24	12,786	— 97	27	201,164	+ 3,800	96·75	·25
Leicester	,, 31	4.211	+ 42	..	..	..	..	..
Leith	,, 24	1,066	— 23	23⅔	12,552	— 35	6	..
†Liverpool	,, 17	10,969	— 59	42	449,271	— 9,666	104	..
‡L.C.C.	,, 17	37,840	+11,318	..	1,017,929	+114,610	121½	..
London United	,, 31	12,085	+ 308	..	295,090	+ 4,765	..	..
Lowestoft	,, 31	347	— 24	5	851	— 45	3·5	..
Manchester	,, 31	31,533	+1,631	31	474,755	+13,297	89·5	11
Newcastle	,, 31	8,146	— 228	31	121,083	— 7,108	..	..
†Newport	,, 24	615	— 17	30	20,275	— 1,090	14·5	..
†Northampton	,, 10	482	+ 752	27½	13,377	..	5·5	..
Oldham	Nov. 1	3 469	— 63	31	62,754	— 231	23·75	..
Pontypridd	Oct. 24	797	+ 247	30	11,488	+ 3,412	5·5	1·75
Portsmouth	,, 31	3,313	— 92	31	66,253	+ 386	14·5	..
Preston	,, 28	1,378	— 60	..	..	..	..	..
†Reading	,, 8	630	+ 3	27⅔	17,745	+ 180	13·25	..
Rotherham	,, 29	1,204	+ 12	30½	18 822	+ 85	10	·66
Salford	,, 26	9,043	— 127	20	142,691	— 125	38·9	..
Sheffield	Nov. 1	10 825	— 353	32	177 302	— 1,682	87	1·35
Southampton	Oct. 28	1,996	— 36	30	33,896	+ 1,546	..	..
Southend-on-Sea	,, 28	717	+ 93	31	15,874	+ 1,255	..	..
South Shields	,, 24	1,057	— 40	..	17,297	— 320	..	..
Swindon	,, 28	263	— 35	..	..	..	4·4	..
Tyneside	,, 28	908	— 77	17	7,446	— 817	8·87	..
Wallasey	,, 31	1,673	+ 147	30½	28,614	+ 1,428	8·72	·22
Walthamstow	,, 31	1,130	+ 103	31	20,877	+ 1,029	9	..
West Ham	,, 22	4,410	— 11	30	67,282	— 3,606	14·7	..
Wolverhampton	,, 28	1,578	— 56	30	25,974	— 572	12·5	..
Baker St.-Waterloo	,, 31	6,890	+1,485	18	54,270	+11,565	4·25	1
Cen. London Rly.	,, 31	16,816	+5,560	18	136,950	+46,617	6·32	·55
Char. +, Eus. Hamp.	,, 31	7,105	+1,680	18	59,710	+13,720	7·75	..
City & S. Lon. Rly.	Nov. 1	6,475	+ 95	18	54,112	— 979	7·8	1·05
Dublin-Lucan Rly.	Oct. 30	249	+ 22	17	2,497	— 38	7	..
G.N. and City Rly.	,, 31	2 801	— 721	18	23,741	— 5,504	3·5	..
G.N., P'dy. & Brmtn.	,, 31	11,100	+1,880	18	90,845	+17,695	9·25	·25
L'pool Overh'd Rly.	Nov. 1	2,674	— 462	18	25,489	— 3,438	6·8	4·3
Mersey Railway	Oct. 31	3.799	+ 100	18	33,658	+ 675	4·5	..
Metropolitan Rly.	,, 18	34 488	+2,781	16	259,904	+18,756	16	..
Met. District Rly.	,, 31	20 098	+3,614	18	165,218	+28,188	24	..
Anglo-Argentine	,, 28	51,280	+15,911	..	895,214	+181,063	43	..
§Auckland	,, 9	12,364	+2,150	40⅔	123,413	+19,525	22·3	3·1
Bombay (B.E.T.)	,, 8	5,127	+ 548	40	95,200	+17,067	..	..
§Brisbane	,, 8	14,910	+1,373	..	..	..	..	..
Calcutta	Oct. 31	5,988	+ 490	..	..	..	..	..
§Geneva	Sept.	9,755	+ 634	..	..	..	..	..
§Kalgoorlie, W.A.	,,	4,326	..	39	35,277	..	20·5	..
Madras	Oct. 31	1,234	+ 42	42	24 112	+ 1,813	12·75	..
†Perth (W.A.)	,, 30	2,897	+ 252	44	59,967	— 1,171	25·48	..

* Compared with the corresponding period of 1907. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Afternoon.

The Stock Exchange Holiday on Monday has interfered a good deal with business during the week covered by these notes, while the United States Election has also had a certain amount of restraining effect. Two days before this appears in print the result of the election will, of course, be known. Writing on the day of the contest, the Stock Exchange sentiment concurs with that generally expressed in concluding that Mr. Taft has an almost certain victory in his grasp.

Where the electrical markets will be largely and practically interested in the result of the election lies in the situation as regards copper. The price of the metal is swayed, if not almost entirely controlled, by much the same body in the United States as that which governs the stock markets. This party is understood to be pledged to the idea that Mr. Taft's election not only will, but shall, be followed by a wonderful expansion of trade and prosperity. Prices are to be pushed up in advance of the marvellous impetus given to business all round, and, as usual, the markets have pretty liberally discounted such an event. Railroad shares have risen very substantially, and copper has kept pace with them. The long-anticipated event has materialised; the curtain has rung up; the play is about to begin.

To all appearance, the trouble between the Mexican Light and Power and the Mexico Tramways Company is far from being settled, although hopes continue to be held out that terms will be arranged after all. The Common stock of the Mexican Light and Power has fallen another 2 points, and the Mexico Tramways stock is dullest at 135½, *ex* 1 per cent. dividend.

Amongst this group the chief improvement during the week has been a rise of 2⅜ in Rio Janeiro shares to 71, and the 5 per cent bonds are better at 91. Sao Paulo moved up to 157; business in the bonds has been marked at 100⅜. British Columbia Electric Railway issues moved somewhat irregularly. The strength of Anglo-Argentine trams is further shown by another advance in the Second Preference. British Electric Tractions dwindled, an unpleasant feature being a point decline in the 5 per cent. First Debenture stock.

Better tone in the Home Railway market replaced loss upon Central London Ordinary stock, and caused a rise of 1 in the Deferred. Both Metropolitan Consolidated and District Ordinary have hardened. Metropolitan Surplus Lands has regained its fall of a point, and there has been more demand for underground issues. The 4 per cent. Debenture stocks of the different "Tube" Railways underwent no change, but the two junior issues of the Underground Electric Railways of London are both 10s. better.

Electricity Supply descriptions are without any material alteration. The weakness of Newcastle-on-Tyne Ordinary shares has spread to the Preference, which are ⅛ lower. St. James' Electric Preference at 7⅛ are 5s. up, and Oxford shares put on 2s. 6d. at 6. Urban Preference are sellers at 2. A few Debenture stocks are lower by the amount of the interest deducted last week, and with these the list of movements practically ends.

In the Telegraph market there is fairly general firmness, although Globe Telegraph and Trust Ordinary are 2s. 6d. down, and the Preference have not recovered their loss of a similar fraction last week. Great Northerns rose 10s. more, while Indo-Europeans, *ex* 12s. 6d. dividend, are nominally unchanged, after being 20s. down. Cuba Telegraph Preference are *ex* 10s., but only show 5s. fall. American Telephone and Telegraph capital stock is up a point, and National Telephone stocks enjoyed a slight rally.

The weakness of British Aluminiums is anything but relished by the shareholders, and it is very difficult to obtain certain information as to the cause of the drooping of the prices in the shares.

Babcock & Wilcox eased off 1/16, and Callenders, *ex* 5s., are quoted this amount lower. General Electric Preference at 7¼ are 5s. down. Other manufacturing varieties keep very quiet.

Prospectus.—*Ledbury Rubber Estates, Ltd.*—This company has been before the public with an issue of 40,000 shares of £1 each. The company is to amalgamate a number of rubber estates aggregating (2,753 acres) in the State of Selangor, Malay Peninsula.

City of Buenos Ayres Tramways Co. (1904), Ltd.—The directors announce a dividend of 1s. 3d. per share, less income-tax, for the three months ended September 30th.

West African Telegraph Co., Ltd.—The directors announce an interim dividend of 4 per cent. per annum (4s. per share), free of income-tax, for the half-year.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations Oct. 27th.	Closing Quotations Nov. 3rd.	Business done week ended Nov. 3rd, 1908. Highest.	Lowest.	Rise + or Fall −	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	2¼ — 3¼	2¼ — 3¼	..	..	..	Nil.
136,700	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	Nil	5 %	5 %	5 %	90 — 93	90 — 93	..	..	..	5 7 6
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7¾%	7¾%	8 %	8 %	129 —133	129 —133	..	..	..	6 0 4
$53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	92 — 94	93 — 95	..	..	+ 1	4 4 3
598,180	Anglo-American Telegraph	Stock	23%	31%	37%	34%	58 — 61	57 — 60	..	..	— 1	5 16 8
3,200,910	Do. do. do. 6 % Pref.	Stock	5%	6 %	6 %	6 %	102 —108	102 —108	102⅜	102¼	..	5 16 6
3,200,910	Do. do. do. Deferred	Stock	Nil	⅛%	1⅜%	1 %	16¼ — 17	16¼ — 17	16¼	16⅛	..	5 17 8
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	..	5 %	5 %	5 %	99 —102	99 —102	..	..	..	4 16 2
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	8 %	8 — 8¼	8 — 8¼	..	..	..	4 14 1
3,889,376	Commercial Cable Stng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	88 — 90	88½ — 89½	90	..	..	4 8 11
16,000	Cuba Telegraph	10	5 %	5 %	5 %	6 %	7⅜ — 8⅜	7⅜ — 8⅜ xd	..	..	..	7 1 2
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16½ — 17½	16½ — 17½ xd	..	..	..	5 15 11
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3 — 3⅜	3 — 3⅜	..	..	..	5 14 3
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8 — 9	8 — 9	..	..	..	5 8 1
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100 —103	100 —103	102½	..	..	8 14 10
60,710£	Direct United States Cable	20	8½%	4½%	4⅝%	4½%	18½ — 18¾	18½ — 18¾	18⅛	..	..	6 2 6
50,900£	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	135 —138	135 —138	137	136½	..	5 1 5
2,000,000	Do. 8½ % Pref. Stock	100	8½%	8½%	8½%	8½%	84 — 86	84 — 86	85⅛	84½	..	4 1 5
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	103 —105	102 —104 xd	104⅛	103½	..	3 16 11
800,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	7 %	12½ — 13	12½ — 13	12⅝	12⅜	..	5 7 8
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	101 —103	101 —103	102½	101½	..	3 17 8
269,700	East & S. Afric. Tel., 4 % Mt. Db., 1 to 8,000, red. 1909	100	4 %	4 %	4 %	4 %	99¼ —101½	99½ —101½	..	..	..	3 18 10
200,000£	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	101½ —103½	92½ —101½ xd	..	..	..	3 18 10
181,127	Globe Telegraph and Trust	10	5⅝%	5⅝%	5⅝%	5⅝%	10⅝ — 11⅛	10½ — 11	10½	10½	— ⅛	5 9 6
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	13⅜ — 13⅞	13⅜ — 13⅞	13⅜	13⅛	..	4 6 6
150,000	Great Northern Telegraph, of Copenhagen	10	24 %	24%	20 %	20 %	29½ — 31½	30 — 32	..	..	+ ½	6 5 0
19,600£	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,300, Red.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	56 — 59	56 — 59 xd	58	..	..	5 2 7
£1,380,400	Mackay Companies Common	$100	1 %	2 %	3½%	4 %	70 — 75	74 — 78	77	..	+3½	5 8 1
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	68 — 72	70 — 74	..	..	+2	5 9 7
394,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	Nil	⅝ — ⅞	⅝ — ⅞	8/9	..	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	4 %	5 %	6 %	6 %	1 — 1⅛	31/32 — 1 1/32	..	..	— 1/32	5 9 1
86,492	Do. do. 5 % Pref.	1	5 %	5 %	5 %	5 %	⅞ — 1	⅞ — 1	18/3	..	..	5 0 0
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	109 —111	109 —111	109⅜	108½	..	5 8 1
3,725,000	Do. do. Def. Stock	100	5 %	5 %	5 %	6 %	116½ —118½	117 —119	118⅛	116⅝	+ ⅛	5 0 10
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½	10½	..	..	5 6 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	5 %	5 %	10½ — 11½	10½ — 11½	..	..	..	4 8 11
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅞ — 6 1/16	5⅞ — 6 1/16	5⅞	..	..	4 7 1
2,000,000	Do. do. 5 % Deb. Stock Red. ..	Stock	5⅛%	5⅛%	5⅛%	5⅛%	97⅞ — 99½	98 —100	98⅛	98	..	3 10 4
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	102 —104	102 —104	102½	102	..	3 16 11
179,318	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	6¾%	7 %	7 %	8 %	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	5 16 4
50,000	Do. do. do. 6 % Cum. Pref.	1	6 %	6 %	6 %	6 %	1⅛ — 1⅜	1⅛ — 1⅜	22/9	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	..	4 %	4 %	4 %	90 — 93	90 — 93	90½	..	..	4 6 0
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 —103	100 —103	..	..	..	3 17 8
11,833£	Reuter's	8	5 %	5 %	5 %	5 %	7 — 8	7 — 8	..	..	..	5 0 0
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	..	4½%	4½%	4½%	100 —103	100 —103	100½	..	..	4 7 5
3,083	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 12 4
100,000	United River Plate Telephone	5	8 %	8 %	8 %	8 %	6⅝ — 6⅞	6⅝ — 7⅛	100½	..	..	5 16 4
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
80,008	W. Coast of America, 1 to 80,000 & 53,001 to 53,008	2½	Nil	Nil	2½%	2½%	1¼ — 1⅜	1¼ — 1⅜	..	..	..	4 3 4
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Bras. Sub. Tel.	100	4 %	4 %	4 %	4 %	100 —103	100 —103	..	..	..	3 17 8
207,930	Western Telegraph, Ltd., Nos. 1 to 207,930.. ..	10	7 %	7 %	7 %	7 %	13½ — 14	13½ — 14	13⅞	13 ⅛	..	5 0 0
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	102 —104	102 —104	102½	..	..	3 16 11
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅝ — 1⅛	⅝ — 1⅛	..	..	..	Ni
84,568	Do. do. 6 % Cum. 1st Pref.	10	6 %	5 %	8 %	6 %	8 — 8½	8 — 8½	..	..	..	7 1 2
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	£2 6	8½ — 9½	8½ — 9½	..	..	..	2 9 0
80,000£	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	101 —103	101 —103	..	..	..	4 17 1

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	8 %	9 %	8¼ — 8½	8 1/16 — 8 1/16	8 1/16	8 1/16	+ 1/16	5 1 5
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5⅛%	5⅛%	5⅛%	5⅛%	6⅝ — 6⅞	6⅝ — 6⅞	6⅞	..	..	4 10 3
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	141 —146	141 —146	..	..	..	4 2 2
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102 —105	102 —105	..	..	..	4 15 3
580,000	Babcock & Wilcox, 1 to 580,000	1	20 %	20 %	20 %	20 %	3⅞ — 4	3 1/16 — 3 1/16	77/6	76/3	— 1/16	5 1 3
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	3 13 10
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	7 %	1⅜ — 2⅛	1⅜ — 2⅛	..	..	— ⅛	15 1 2
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	3 — 4	3 — 4	67/6	..	..	8 15 0
40,000	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	4 — 4½	4 — 4½	..	..	..	6 13 4
11,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3¾ — 4¼	3¾ — 4¼	..	..	..	4 12 7
43,473	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	5 %	106 —110	104 —108	..	..	—2	4 10 11
300,000	Do. do. 5½ % Loch Leven Debs. ..	100	..	..	5½%	5½%	97 —100	97 —100	..	..	..	5 10 0
400,000	British Columbia E. Rail Def. Ord. Stock	100	6 %	6 %	6 %	8 %	135 —139	135 —139	137	..	..	5 15 1
400,000	Do. 5 % Pref. Ord. Stock	100	5 %	5 %	5 %	5 %	116 —120	115 —119	102½	102	—1	4 4 0
800,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	106 —110	106 —110	..	..	..	4 10 11
388,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	101 —103	101 —103	102½	..	..	4 7 6
220,00£	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	102 —105	103 —106	105	103½	+1	4 4 11
133,331	British Electric Traction	10	6 %	3 %	Nil	Nil	⅞ — 1⅛	⅞ — 1⅛	..	..	..	Nil
161,437	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	3 %	3⅜ — 4¼	3¼ — 4	..	..	— ⅛	7 10 0
1,473,653	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	90 — 95	89 — 94	..	..	—1	5 6 3
628,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	76 — 78	73 — 75 xd	..	..	..	6 0 0
100,000	British Insulated and Helsby Cables	5	8 %	8 %	10 %	10 %	6¼ — 6⅞	6¼ — 6⅞	..	..	..	7 8 2
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6 — 6½	6 — 6½	..	..	..	4 12 4
600,000	Do. do. 4½ % 1st Mort. Deb. Red. ..	100	4½%	4½%	4½%	4½%	103 —106	103 —106	104	..	..	4 4 11
208,440	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	91 — 96	91 — 96	..	..	..	4 18 9
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	Nil	5/16 — 7/16	5/16 — 7/16	..	..	..	Nil
1,016,358	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	40 — 45	40 — 45	..	..	..	8 17 10
50,000	‡Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	Nil	¾ — 1¼	¾ — 1¼	..	..	..	Nil
50,000	‡ Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
105,731	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	Nil	2½%	Nil	Nil	0 — ½	0 — ½	..	..	..	Nil
150,000	Do. do. Non-cum. 6 % Pref.	2	6 %	6 %	Nil	Nil	½ — ¾	½ — ¾	2/6	..	..	Nil
125,000£	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	68 — 73	68 — 73	..	..	..	6 3 3
125,000£	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	50 — 54	50 — 54	..	..	..	8 6 0
137,610	Calcutta Trams, 1 to 137,610	5	8 %	8 %	8 %	6 %	4⅜ — 5⅜	4⅜ — 5⅜	..	..	..	5 11 8
45,104	Do. 5 % Cum. Pref., Nos. 1 to 39,880..	5	..	5 %	5 %	5 %	4½ — 5½	4½ — 5½	..	..	..	4 15 8
350,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	103 —106	103 —106	..	..	..	4 4 11
85,000	Callender's Cable Construction shares	5	12½%	15 %	15 %	15 %	9½ — 10½	9½ — 10½ xd	..	..	..	7 2 10
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	5⅜ — 5⅞	5⅜ — 5⅞	..	..	..	5 6 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	107½ —109½	107½ —109½	..	..	..	4 2 2
491,293	Cape E Trams., 1 to 491,293	1	5 %	Nil	Nil	Nil	⅛ — ¼	⅛ — ¼	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	4 %	6 %	8 %	12 %	1 1/16 — 1 1/8	1 1/16 — 1 1/8	32/9	31/6	..	7 14 10
210,153	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	4½%	103 —107	103 —107	105	..	..	4 4 1
1,898,610	Central London Railway, Ord. Stock	Stock	4 %	4 %	4 %	3 %	68 — 70	68 — 70	69	68	..	4 5 9
558,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	86 — 88	86 — 88	..	..	..	4 10 11
558,195	Do. do. Def. do.	Stock	4 %	4 %	2 %	2 %	49 — 52	50 — 53	52	51½	+1	3 15 6
1,480,000	City and South London Railway	Stock	2⅛%	1⅞%	2⅛%	2⅛%	32½ — 33½	32½ — 33½	32⅝	32½	..	6 6 10

* Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations Oct. 27th.	Closing Quotations Nov. 3rd.	Business done week ended Nov. 3rd, 1908. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
85,000	Crompton & Co., Nos. 1 to 85,000	*	2½%	2½%	5 %	5 %	1⅞— 1⅞	1⅞— 1⅞	..	..	..	9 10 6
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	98 —101	98 —101	..	..	..	4 19 0
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1⅛— 1⅛	1⅛— 1⅛	23/3	..	..	7 12 5
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 — 1½	1 — 1½	22/-	..	..	4 16 0
276,880	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6%	6 %	6¾%	11½— 12½	11½— 12½	..	..	..	5 4 0
60,000	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12½— 13½	12½— 13½	..	..	..	4 8 11
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	2½%	4½%	4½%	4¾%	1/16 — 1/16	3/16 — 3/16	..	..	+ 1/16	15 7 6
17,139	Do. "A" shares, 01—017,139	5	2½%	4½%	4½%	4¾%	1⅛ — 2⅛	1¼ — 2⅛	..	..	..	8 6 9
317,875	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	76 — 79	76 — 79	..	..	..	5 1 3
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	84 — 87	84 — 87	..	..	..	5 14 11
112,100	Electric Construction, 1 to 112,100	2	4 %	Nil	Nil	Nil	1/16 — 1/16	1/16 — 1/16	..	..	..	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	7 %	7 %	1½ — 1⅝	1½ — 1⅝	..	..	..	8 0 0
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	5 %	7½ — 7⅝	7 — 7⅛	..	..	— ½	16 13 4
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	84 — 88	84 — 88	..	..	..	4 10 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	4 %	¾%	½ — 1	½ — 1	..	..	..	5 0 0
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	7 %	10½— 10⅝	10½— 10⅝	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —108	102 —108½	..	..	..	4 17 1
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15 %	15%	15 %	15%	10½— 11½	10½— 11½	11½	..	..	7 8 2
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5½	5 — 5½	..	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	107 — 109	107 —109	108⅝	..	..	4 2 7
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	5 %	10%	10 %	10 %	16⅜— 17½	16⅜— 17⅝	16⅝	..	..	5 14 8
87,500	†Liverpool Overhead Railway, Ord.	10	1¾%	Nil	Nil	¾%	1⅛ — 1½	1⅛ — 1½	..	..	..	4 0 0
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	5 — 5½	5 — 5½	..	..	..	9 1 10
600,070	London United Trams. (1901), 1 to 50,007	10	6 %	8 %	8 %	8 %	6½ — 6⅝	6⅛ — 6⅝	..	..	..	4 8 11
899,980	Do. do. 60,008 to 100,000	10	6 %	8 %	8 %	8 %	6½ — 6⅝	6⅛ — 6⅝	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	5 %	4½ — 5⅛	4½ — 5⅛	5¼	97/6	..	9 1 10
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	72 — 77	70 — 75	..	..	—2	5 6 8
5,732,062	Metropolitan Consolidated	100	3 %	2⅜%	1 %	⅛%	38 — 39½	38⅛— 39⅜	39	38½	..	1 5 7
2,640,914	Do. Surplus Lands	100	2⅜%	2⅜%	2⅜%	2⅜%	67 — 69	68 — 70	69½	..	+1	3 18 7
3,235,000	Do. District	100	Nil	Nil	Nil	Nil	12⅜— 13⅜	13⅜— 14⅜	14½	13⅜	+1	Nil
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	Nil	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	¼ — ½	¼ — ½	15/7½	..	..	5 19 5
823,800	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	92 — 95	92 — 95	93¾	..	..	4 14 9
245,500	Potteries E. Tro.	1	5 %	4 %	4 %	4 %	⅛ — ¼	⅛ — ¼	..	..	..	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	¼ — ½	¼ — ½	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	92 — 95	92 — 95	..	..	..	4 14 9
37,350	Telegraph Construction and Maintenance	12	15 %	15 %	15 %	17½%	32 — 34	32 — 34	32	..	..	6 18 8
150,000‡	Do. 4 % Deb. Bds., 1 to 1.500 Red., 1909	100	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	8 17 8
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	..	..	92⅛— 9 ⅛	91½— 92½ xd	93	91½	..	..
2,800,000	Do. do. 4½% Bonds	..	..	..	..	..	75 — 76	75½— 76½	76	75⅝	+ ⅛	..
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	22½— 23½	23 — 24	23⅝	23	+ ½	..
66,666	Willans & Robinson, 1 to 80,000 & 80,001 to 116,666	1	Nil	Nil	Nil	10 %	½ — 1	½ — 1	..	..	..	10 0 0
66,666	Do. 6 % C.P., 80,001 to 80,000 & 125,001 to 141,666	5	Nil	Nil	..	6 %	2⅜— 2¾	2⅜— 2¾	5⅜/6	47/6	..	10 8 8
246,404	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4%	72 — 76	72 — 76	75¾	72	..	5 5 3

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	5	5½%	5½%	5½%	5½%	4⅜— 4⅞	4⅜— 4⅞	..	..	..	5 11 5
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	96 — 100	94 — 98 xd	..	..	..	4 10 0
30,275	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10 %	10 %	7 — 8	7 — 8	..	..	..	6 5 0
9,725	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	7 — 8	7 — 8	..	..	..	4 7 6
886,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	99 — 102	99 —102	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	8 %	5 %	5 %	5 %	3½ — 4	3⅞ — 4	85/-	..	..	6 5 0
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	3½ — 4½	3½ — 4½	..	..	..	5 5 11
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3½ — 3⅝	3½ — 3⅝	..	..	..	6 0 0
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 — 99	96 — 99	97½	..	..	4 10 11
49,486	Chelsea Electricity Supply, Ord.	5	6 %	6 %	4½%	4½%	2⅞ — 3⅛	2⅞ — 3⅛	..	..	..	6 13 4
175,000‡	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	9½ — 10	9½ — 10	9½	..	..	6 0 0
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 13	12 — 13	12½	..	..	4 12 4
400,000‡	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	122 —125	122 —125	..	..	..	4 0 0
300,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
50,000	County of Durham Electrical Power, Ord.	5	£3 7 0	4 %	4 %	2 %	2½ — 3	2½ — 3	..	..	..	3 6 8
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	3½ — 4	3½ — 4	..	..	..	6 5 0
200,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	..	99 —101	99 —101	108½	..	..	..
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4½%	5 %	5 %	5 %	7 — 8	7 — 8	..	..	..	6 5 0
50,026	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10½— 10⅝	10½— 10⅝	..	..	..	5 11 8
400,000‡	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	107 —110	107 —110	..	..	..	4 1 10
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	99 —102	99 —100 xd	..	..	..	4 8 3
80,000	Edmundson's Electric Corporation, Ord. Shares	5	7 %	4 %	Nil	Nil	⅛ — ¼	⅛ — ¼	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	3 %	Nil	½ — 1	½ — 1	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	59 — 66	59 — 66	..	..	..	6 16 4
$8,150,000	Electrical Dev. Co. of Ontario, 5% 1st Mtg. Gold Bnds.	$500	..	..	..	..	81 — 84	81 — 84	85½	81	..	..
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4⅜— 5⅛	4⅜— 5⅛	..	..	..	5 4 9
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	..	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	97 —100	97 — 100	..	..	..	4 10 11
15,000	Hove, 1 to 15,000	5	8½%	9 %	9 %	8½%	6 — 6¼	6 — 6¼	..	..	..	6 10 9
$1,325,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	..	94 — 96	94 — 96	95¼	95	..	..
21,000	Kensington and Knightsbridge Electric Ord.	5	12 %	10 %	10 %	10 %	7⅜— 8⅜	7⅜— 8⅜	..	..	..	5 14 8
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	94 — 97	94 — 97	97⅜	..	..	4 2 6
111,000	London Electric Supply Corporation, Limited, Ord.	3	3 %	4 %	4 %	2½%	⅞ — 1⅛	⅞ — 1⅛	..	..	..	5 8 1
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	6 9 9
374,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4 %	4½%	89 — 92	89 — 92	..	..	..	4 17 10
900,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	10 %	8 %	6½%	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	6 16 10
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅜ — 4⅝	4⅜ — 4⅝	..	..	..	4 12 4
220,000‡	Do. 4½ % 1st Mort. Debens. Stock	..	4½%	4½%	4½%	4½%	105 —109	105 —109	..	..	..	4 2 7
340,000‡	Do. 3¾ % Mort. Deben. Stock Redeem.	Stock	3¾%	3¾%	3¾%	3¾%	84 — 89	84 — 89	..	..	..	3 18 8
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	86 — 88	86 — 88	86⅜	86	..	5 13 8
$13,586,000	Do. Light and Power Co., Ltd., Common	$100	..	..	..	..	74 — 76	72 — 74	72½	72½	—2	..
$1,500,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	..	109 —111	104 — 106 xd	109	106	..	..
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	..	88 — 90	88 — 90	£9½	88½	..	..
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	8 %	4⅞— 5⅛	4⅞— 5⅛	5 7/32	..	..	7 8 10
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	5⅛— 5⅜	5 — 5⅛	5⅛	..	— ⅛	4 10 11
10,852	Notting Hill Electric Lighting	10	7 %	7½%	7½%	7½%	11⅝— 12⅞	11⅝— 12⅞	..	..	..	5 17 8
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	7 %	5⅞— 6⅛	6⅛ — 6⅜	..	..	+ ⅛	5 12 0
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	95 — 99	95 — 98	..	..	..	4 1 8
119,694	River Plate Electy. Co. Ord. Nos. 1 to 120,507	1	..	..	2½%	..	1⅜— 1⅝	1⅜— 1⅝	23/9	..	..	..
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6	6	6	6	1/16 — 1/8	1/16 — 1/8	20/6	20/3	..	..
194,684	Do. do. 5% Deb. Stk. Red.	100	5	5	5	..	99 —102	99 — 102	..	..	..	4 18 0
40,000	St. James' and Pall Mall Electric Light, Ord.	5	14½%	12½%	10 %	10 %	7⅜— 8⅛	7⅜— 8⅛	..	..	..	6 1 3
20,000	Do. do. 7 % Pref. 20,001 to 40,000	5	7 %	7 %	7 %	7 %	6⅜— 7⅛	6⅜— 7⅛	..	..	+ ⅛	4 13 4
150,000‡	Do. do. 3¾ % Deb. Stock Red.	100	3¾%	3 %	3¾%	3¾%	86 — 90	86 — 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	4 %	Nil	Nil	⅛ — ¼	⅛ — ¼	..	..	..	Nil
46,700	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	68 — 72	68 — 72	..	..	..	5 11 1
65,000	South London Electricity Supply, Ord.	5	4 %	4 %	3 %	4 %	2⅛— 2⅜	2⅛— 2⅜	..	..	..	7 5 5
120,000	South Met. Elec. Lt. & Power, Ord.	1	Nil	2½%	2½%	2½%	⅛ — ¼	⅛ — ¼	..	..	..	4 0 0
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1⅛— 1⅜	1⅛— 1⅜	..	..	..	6 4 5
200,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	99 —102	99 —101	..	..	..	4 8 3
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	½ — 1	½ — 1	..	..	..	20 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	1⅝— 2⅜	1⅝— 2⅛	..	..	— ⅛	11 2 2
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	80 — 83	80 — 83	..	..	..	5 8 5
800,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000	1	..	..	..	..	⅜ — ⅝	⅜ — ⅝	..	..	..	..
110,000	Westminster Electric Supply, Ord.	5	14 %	13 %	12 %	10 %	7⅛— 8⅛	7⅛— 8⅛	..	..	..	5 17 8
81,279	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	5 %	4½%	4½%	5 — 5⅛	5 — 5⅛	..	..	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. ‡ Interim Dividend.

Bank rate of Discount 2½ per cent. May 28th, 1908.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING SEPTEMBER, 1908.

In our reference to the August electrical business, we had occasion to remark on the apparently flourishing condition of the British export trade. The September returns are even better than those of August, the total value of the exports, £224,913, being over £1,000 to the good in comparison, and constituting a record as regards our statistics.

Moreover, the re-exports, though, of course, representing a proportionately small value, have practically doubled the previous month's total, being £20,345.

The imports, which amounted to £154,812, are some £9,000 better than in the month of August. In this connection it is interesting to note that the nine months' average of the exports for the present year is £203 thousands, a value which compares with £167·7 thousands, the corresponding average for the whole of 1907. The imports only averaged £155,000 over the nine months, showing practically no improvement over the 1907 figure. Of the individual items in the export section, electrical machinery, £112,735, and cables, £63,733, are worthy of note, the former especially representing an exceptional value—to some extent neutralised, however, by the small total recorded for electrically driven machinery.

As in the August returns, the lamp imports, totalling for September £50,248, are an outstanding feature, being some £10,000 ahead of the previous month; machinery, cables and telephones follow in order, but with comparatively small values. Our most prominent customer during September was New South Wales, which absorbed some £28,000 of machinery alone; India, Japan and Canada were also high on the list. Of importers, Germany, as usual, took the premier position—especially if allowance be made to that country for a proportion of the apparently high Dutch total.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.*

Country receiving exports and importing.	Electrical goods and appliances.	Electrical cable.	Electric lighting fittings and accessories.	Electric lamps.	Electric meters and instruments.	Electric machinery.	Batteries and accumulators.	Carbons.	Telegraph and telephone material, and electric bells.	Electrically-driven machinery.	Tramway apparatus and materials.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	78	324	52	76	252	7,336	47	60	156	...	...	8,381
Germany	340	1,796	126	42	239	203	10	...	...	...	...	2,756
Netherlands	281	337	45	44	38	547	4	...	...	...	...	1,296
Belgium	64	517	73	...	203	1,214	15	...	358	3	...	2,417
France and Algeria	43	30	7	872	4	271	...	26	22	4	...	1,279
Portugal, Madeira and Portuguese Africa ...	89	545	49	261	4	768	17	...	38	31	...	1,802
Spain	39	35	14	...	152	247	53	5	...	...	...	545
Italy and Austria-Hungary	47	226	67	143	430	1,420	76	71	...	...	...	2,480
Greece and Turkey	6	8	83	...	...	292	179	...	...	...	...	568
Channel Isles, Gibraltar and Malta	128	239	26	24	118	481	6	...	7	...	...	1,029
U.S.A., Philippine Islands and Cuba	50	487	596	...	195	346	...	8	...	...	...	1,682
Canada and Newfoundland	173	10,557	153	19	...	6,241	3,042	...	13	...	...	20,198
British West Indies, British Honduras, and British Guiana	40	...	26	10	...	71	7	4	...	...	...	158
Mexico, Nicaragua and Colombia	49	59	108	7	...	3,824	61	...	53	...	...	4,161
Peru and Uruguay	14	50	37	13	...	18	120	6	...	...	...	258
Chile	155	845	164	34	161	59	...	21	...	...	...	1,439
Brazil	577	441	296	179	...	12,162	3	11	...	...	...	13,469
Argentine	856	3,598	441	950	91	2,190	385	311	1,103	...	...	9,925
Egypt and Tunis	425	969	70	90	205	2,067	...	...	...	11	...	3,837
British West Africa	25	53	146	48	61	48	16	...	83	...	...	480
Cape of Good Hope	421	1,399	246	395	100	1,594	3	5	81	3	...	4,247
Natal	1,654	4,740	66	761	275	8,377	456	28	35	...	...	16,392
British East Africa and Mauritius	49	26	14	15	...	6	...	...	3	...	...	113
China and Siam	1,298	2,209	1,087	838	17	2,690	8	14	...	...	...	8,161
Japan	113	12,878	24	26	1,156	9,440	122	...	6	...	...	23,765
Java and Dutch Indies	20	197	...	...	...	89	...	...	...	...	...	306
India	1,273	6,357	1,741	973	479	16,182	356	264	196	2,018	...	29,839
Burmah	376	1,059	31	268	2	492	...	15	90	322	...	2,655
Ceylon	30	193	15	37	10	372	11	...	9	...	...	677
Straits Settlements and Fed. Malay States, Brit. North Borneo, Sarawak and Labuan	213	1,260	311	173	4	138	1,810	50	68	...	...	4,027
Hong Kong	242	1,383	342	84	....	294	...	5	24	...	...	2,374
West Australia	67	115	51	132	136	535	23	8	20	...	...	1,087
South Australia	224	2,551	76	5	...	1,243	30	...	516	...	...	4,645
Victoria	581	3,374	68	15	...	813	28	5	8	...	...	4,892
New South Wales	1,577	2,879	499	1,562	226	27,705	180	25	593	...	...	35,246
Queensland	...	291	31	24	14	982	15	...	298	...	...	1,655
Tasmania	20	...	...	6	...	...	60	...	39	5	...	130
New Zealand	497	1,706	1,071	197	1,054	1,978	29	...	...	10	...	6,542
Total, £	11,934	63,733	8,252	8,323	5,626	112,735	7,172	942	3,789	2,407	...	224,913

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

	£	£	£	£	£	£	£	£	£	£	£	£
Norway, Sweden and Denmark	...	345	...	65	...	413	405	37	5,710	...	...	6,975
Germany	1,380	5,681	911	20,888	...	12,622	1,341	2,582	1,581	15	...	47,001
Holland	430	5,935	226	25,215	8	3,583	632	5,081	647	180	...	41,934
Belgium	880	7,395	521	2,465	12	2,707	146	1,154	7,888	...	...	23,176
France	5	2,881	173	1,213	726	774	2,643	2,793	311	9	...	11,528
Italy	...	...	...	30	...	1,900	...	...	...	...	...	1,930
United States	1,063	317	1,628	375	8	9,712	1,274	51	4,375	3,365	...	22,168
Total, £	3,766	22,554	3,459	50,248	754	31,711	6,441	11,698	20,512	3,569	...	154,712

Additional Imports: Portugal, batteries, £100.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

	£	£	£	£	£	£	£	£	£	£	£	£
Various countries, mainly as above	3,022	2,007	...	2,702	...	2,311	963	635	8,705	...	...	...

TOTAL EXPORTS: £224,913. TOTAL RE-EXPORTS: £20,345. TOTAL IMPORTS: £154,812.

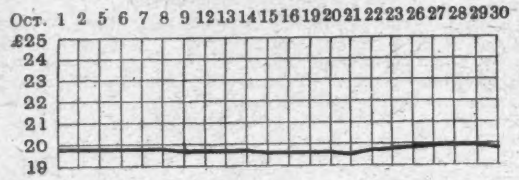
NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

* This section does not include telegraph cables and apparatus.

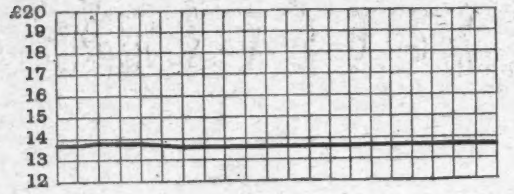
METAL MARKET.

Fluctuations in October.

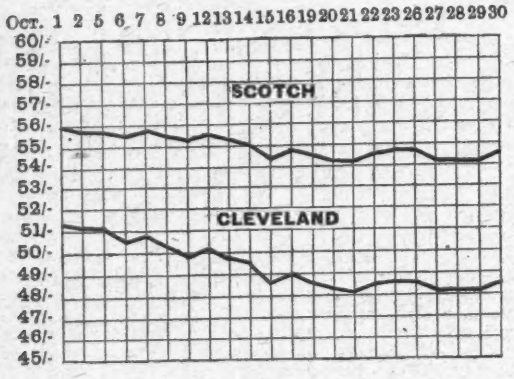
SPELTER (G.O.B's.).



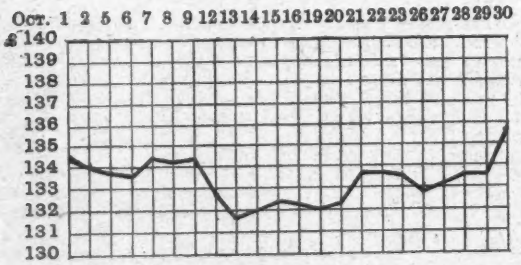
LEAD (ENGLISH).



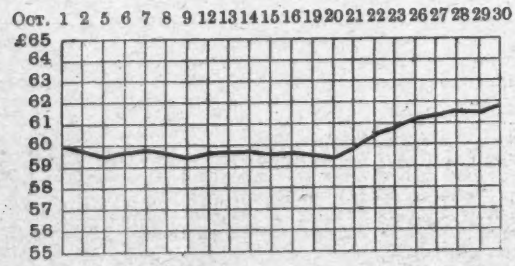
IRON.



TIN.



COPPER (G.M.B's.).



Italy.—The Italian Customs authorities have lately given a decision to the effect that "carbons for electric lamps with a metallic thread in the interior destined to facilitate the combustion of the carbon," are to be classified under No. 289B of the tariff, the duty being 10 lire per 100 kg.

PARLIAMENTARY.

London & District Electricity Supply Bill.

Wednesday, October 28th.

Mr. Parshall, in answer to Mr. Williams, for Stepney Borough Council, said that they took five years for the compulsory acquisition of lands, and did not anticipate any trouble with the owners of the land. They had to have £600,000 and £240,000 called-up capital and substantially commence their work within two years. They were not bound to lay a single cable in that time, nor was there anything in the Bill which compelled them to give a supply within that period. If they became insolvent, or could not carry on the company profitably, there was nothing in the Bill which caused their powers to cease in that area. Counsel was proceeding to press Witness on this point, when the Chairman remarked that it was really a matter for argument. He was not satisfied that Stepney could supply electricity at £3 10s. per kw. and one-third of a penny per unit.

Counsel: In the other House you struck out the word "Docks" in your clause. Why do you not strike out the words "Rivers or Canals?"—Docks are situated in one district, whilst rivers and canals run through different areas.

Counsel said that the Stepney authority supplied Tilbury Docks and Railways to the extent of £1,200 a year, and if the Bill came into force they would lose that, if the promoters exercised their rights.

Counsel: You admit the principle of excluding certain areas from your Bill?—Yes.

Counsel: Do you take powers to go into the Inns of Court?

Mr. Fitzgerald: That is not an industrial area.

Mr. Gerald Sanders, for the Islington Borough Council, cross-examined witness at length as to what amount of the 233 million units that the promoters estimated they could supply for £740,000, was units supplied for power.

Witness said he thought that 85 per cent. would be taken up of power users. What they were trying to do was to supply in bulk; they were not a lighting company. They could generate at a cheaper rate than hitherto and effect a saving of £610,000. That was partly made up of capital charges.

Do you know that, for the last few years, the existing companies have been endeavouring, to the best of their ability, to increase their power supply?—I suppose they have.

And in that manner they have improved their diversity factor and reduced their costs of generation all round?—I will accept that as a general statement, but with great reservation as to Islington. He would accept the figures that Islington had increased their power supply from 76,000 units in 1902 to 1,740,000 units in 1907.

Do you know, as a matter of fact, that that has reduced the cost?—I will take it from you that it has.

Questioned on Clause 53, witness said he thought that the question of raising the price, when they once got into an area, rested with the Board of Trade.

Replying to Mr. A. G. Bingham, Witness said it was not their intention to take over all the undertakings in London. They might acquire one or two undertakings which were not working profitably. They had tried to put before Parliament as comprehensive a scheme as possible.

Mr. Balfour Browne cross-examined Mr. Parshall on behalf of the eight existing companies. Witness said that if the promoters were not able to supply electricity at a cheaper rate than what was now being done by the existing companies, there was no use for the scheme. He admitted that although they estimated a saving of £640,000, a certain sum of money would also have to be paid in interest on money already sunk in electrical schemes. He took it from counsel that the existing companies had already spent £14,000,000. There were 29 different systems of electricity supply in London.

Mr. Fitzgerald re-examined witness. He thought that the present electrical system was too divided up to be worked with economy. Their scheme was a concentrated one, and therefore must result in some economies.

Replying to Mr. Walden, M.P., who asked witness whether it was a fact that the bulk company in Chicago had been of benefit to the smaller companies, Witness said that they were much better off since the establishment of the bulk company; they were more prosperous, and their shares stood higher now than hitherto.

In answer to Mr. Parker, M.P., Mr. Parshall said that £60,000 had to be raised at once, and that was altogether an exceptional provision, but it was inserted to meet the decision of Lord Cromer's Committee to mark the responsibility of the promoters. About £2,000,000 would be the amount of capital to start with, and they would begin with 20,000 kw. of plant

The Chairman asked whether the words in the Kitson Clause "capital expenditure incurred" meant that the Board of Trade were to take into consideration the total capital expenditure incurred, or whether they were to only consider the charge then going on.

Mr. Fitzgerald said that the words were inserted at the instance of the London County Council. The Board of Trade's attention would be called to the financial position of the authority. He should think they would take into consideration the whole question of capital expenditure, interest and liabilities, and the financial position generally.

The Chairman remarked that it was not quite clear whether it was the charge already incurred that was to be taken into account.

Mr. Fitzgerald: I think they are entitled to look at both, whether it is a question of interest, sinking fund, or capital expen-

diture. Supposing there had been an expenditure of £100,000. There might have been a sinking fund accumulating, and a certain amount might have been paid off that, but yet the charge remains, with the interest on the sinking fund for the £100,000, and that would be one of the matters that the Board of Trade would have to consider. The words were made as wide as possible. As they knew, the London County Council advanced large sums of money for the establishment of these electrical schemes, and so they had a direct interest in those words.

Mr. Balfour Browne said that, with regard to Mr. Parshall's reference to Chicago, all the companies there had amalgamated, and the stocks were therefore all in one.

Mr. Robt. Hammond, M.I.C.E., was the next witness. He said he had been largely interested in the question of the bulk supply of electricity to London. In Manchester they used to have, as in London, several stations, but they had now only two stations, and it had worked more satisfactorily. The putting up of several stations was a great nuisance, not only from the point of view of smoke, but also financially, as they were not economical. The linking up of the different stations, in his opinion, was a most uneconomical way of solving the problem of the electric supply to London. The coupling up of the stations would only perpetuate the present evils.

Counsel: Generally a cheap supply cannot be obtained by coupling up works?—No, certainly not. That is a wrong way to do it. It only increases the available plant, it does not produce cheaper electricity.

Continuing, Witness said that the only way to do away with the waste was to do away with decentralisation and have centralisation. If the manufacturers had the opportunity of obtaining cheap electricity, new industries would spring up. London had the market, and it should have the industries. Mr. Merz, only the other day at the Steel and Iron Conference, said that 95 per cent. of the firms north of the Tyne were using electricity. He thought that the powers already granted had not been taken full advantage of by the existing companies. Speaking generally, there was no doubt that the prices at present charged were very much higher than was proposed in the Bill. They did not bring the Bill forward with the idea that other undertakers should "scrap" their concerns—it was brought in to assist the undertakings. But in some cases the stations were so ill situated that it would be better for them to be scrapped. He thought that a railway supply was especially within the province of a power company.

Thursday, October 29th.

Mr. Balfour Browne, representing the existing companies, cross-examined Mr. Robert Hammond at length as to a set of tables which Mr. Hammond had put in and taken as evidence.

Counsel said that he saw from the tables that a saving of £224,569 would annually be effected to the consumers of London by the promoters' scheme. Was he right in supposing that that saving would not be felt until six years hence?—Witness admitted that was so, but when the machinery of the existing stations began to wear out the saving would be greater.

Counsel proceeded to put to witness a series of questions to show that in six years the actual saving to the consumers of London would be only one-eighth of a penny per unit as compared with present prices?—Yes, but that does not include the railway load.

I am taking your own tables. At some distant date the consumers will get this enormous benefit of an eighth of a penny per unit. Do you think you will get much capital in the City of London if you tell the public that at some distant date—10, 20 or 30 years' time you are going to save the consumers one-eighth of a penny per unit?—I would not put it that way. As years go on the existing plant will become less efficient and more worn out, and as years go on the benefit to the consumers will become greater.

Counsel then put questions to witness to show that his figures in the tables were wrong, and Mr. Hammond said that he based his statistics on the Board of Trade returns.

Replying to Mr. Wedderburn, for the Corporation of Croydon, Witness said he was not aware that any one was coming from Croydon to ask for a supply. He would remind the Corporation of the two alternatives either to "scrap" their undertakings or "combine" with the promoters, and he would suggest that they should allow the promoters to supply them with a peak load for public lighting, the trams, and so forth.

You recommend them not to scrap but to combine?—Yes. I am not aware that Mr. Parshall had advocated that the undertaking should be scrapped.

Will the prices be affected by the distance that authorised distributors are from Barking?—The maximum prices will not be.

Will the actual prices be affected?—That is a matter for the promoters.

May I take it that you have considered whether there will be a flat rate or not?—You may not. We have considered it, but we have not come to a decision. We have taken the average.

The Chairman asked whether he understood it that the prices to stations near Barking would be below the average and stations further away would be higher?—Witness replied it would be highly probable.

Continuing, Witness said there was nothing in the Act which allowed them to force their way into Croydon. Of course, the question of the saving to Croydon depended upon the working costs. He accepted the figures of counsel that the working costs were £18,546, as against £17,778 estimated by the witness in his tables.

Mr. S. Bushe, for the Kensington and Westminster Companies, put it to Witness that during the last few years the price of current for power charged by the West End companies had decreased. Witness said he would take that from counsel.

You have no wish or intention to take up lighting work?—No.

Or no wish to interfere with our small power users?—No.

And your real object is to get at the authorised distributors and make them take a bulk supply?—Yes.

Continuing, Witness said that if the companies did not do their duty, the promoters would try and come in.

Mr. Bushe said that of West End companies' business, 85 per cent. was for lighting and 15 per cent. for power. Witness said that they would not come in for a 15 per cent. load, they would lose money on that. They would take care that Westminster should continue at their present low prices.

Mr. Bushe pointed out that they were charging less than what witness estimated he could supply in his tables.

Questioned on the Kitson Clause in the Bill, Witness said he thought it much better that the consumer should demand a supply at a fixed price, rather than go to the Board of Trade for arbitration.

Mr. Erskine Pollock, for the Middlesex County Council, questioned witness in order to show that they could get their electricity more economically from the North Metropolitan Electric Power Co., who got their coal from barges on the Lea, than by taking it from the promoters, who would have to lay miles of cables. Witness said that Middlesex had never got a supply as cheaply as was now offered them, nor would they ever get it so cheap.

Taking Mr. Hammond's estimates that the cables would last 30 years, Mr. Pollock pointed out that this year the L.C.B. had fixed the life of a cable as 20 years. There was no experience of a 15,000-volt cable. Witness said that if the Middlesex area was struck out of the Bill, the promoters had powers under Clause 72 to supply the North Metropolitan Electric Power Co. or the Metropolitan Electric Supply Co. They had not come to any terms with the North Metropolitan Co.

In answer to Mr. Vesey Knox, for Bexley and other local authorities, Witness admitted that he thought Bexley should have a say in the matter before the promoters came in that area. He always found that local authorities were anxious to get electricity as cheaply as possible. That was why they did not fear, because they had not got any contracts as yet—he knew that the local authorities would come in.

Counsel referred at length to the Hornsey undertaking, which in 1900 Mr. Hammond suggested should be started. That had been started, but the expectations of witness had not been fulfilled.—Witness was aware that the works costs were lower, and he would point out that, as regarded costs and management, they were altogether outside engineering advice.

Counsel asked witness why less than ½ per cent. was allowed for depreciation, and Mr. Hammond explained that the promoters would be enabled to install up-to-date machinery. As regarded obsoleteness, that was one of the risks.

Counsel: As soon as our plant became obsolete we must either put in new plant or take your energy, and pay you the equivalent of £72 per kw.?—As a fixed charge.

Ah! but we should have to pay the £72?—Yes; in conjunction with ·2d.

Counsel: Yes.

Witness, in reply to further questions, said that if either of the authorities whom counsel represented were to make any offers to the promoters, they would seriously consider them. He was aware that Southwark was already supplied by two or three companies.

Do you know that Southwark is supplying for private lighting at 2·41d., and that that is less than any company in London?—How are you doing it?

Counsel: We are just paying our way.

Witness, continuing, said that he accepted the figures of counsel that under their Bill the promoters took powers to compete with one-third of the electricity they sold—represented by power supply—and 12½ per cent. of the revenue.

Mr. Morten, for West Ham, asked witness whether the works there were well managed, and he assented. Referring to the tables put in, counsel said that Mr. Hammond had estimated the average generating costs at ·583d., and the capital charges at 3575d., a total of ·958d. Those statistics were made up to March 31st, 1907. He would take it from counsel that at the end of March 31st, 1908, the figures were, instead of ·583d. for generation, ·382d., and the capital charges were ·253d., instead of ·3575d.—a total of ·635d., as against ·958d., or about two-thirds of the generation costs of 1907. West Ham had a very good load indeed.

Can you tell me any benefit that West Ham will get under this scheme?—The big industries in West Ham will be able to demand a supply from us if the Council should choose at any time to raise their prices unreasonably. It gave the great industries of West Ham the benefit of cheap electricity.

At this stage, Mr. Fitzgerald asked leave that Mr. Oliver Bury, general manager of the Great Northern Railway, might be put in the witness box.

Mr. Oliver Bury then gave evidence in support of the scheme. He said that they would require energy equivalent to 26,000 h.p. for the electrification of their suburban lines. They had not been able to electrify their railway on the ground of the great capital cost involved, and the absence of a cheap and reliable source of supply. It would be of a great assistance if they could get a supply such as that they would get under this Bill. As far as he understood the scheme now before them, it afforded them those facilities.

In cross-examination by Mr. Balfour Browne, K.C., Witness said that of course they must start on the supposition that the supply would be reliable. He could not understand that a company of this kind would spend millions of capital, and not give a reliable supply.

FRIDAY, OCTOBER 30TH.

MR. HAMMOND was further cross-examined, and replying to MR. GERALD SANDERS, for the Islington Borough Council, gave it as his opinion that if the various local authorities were to "scrap" their undertakings and purchase a bulk supply from the promoters, there would be a saving of £56,000 a year to the ratepayers. Islington would benefit to the extent of £6,122. If the local authorities were to take a solid load and work the peak load themselves, the saving would be £112,000. The estimated saving of £640,000 over the whole of London from using a bulk supply in place of the existing means of generation would not come into effect at once—it would only be fully apparent when the present plant was worn out. The bulk supply would prevent the necessity for perpetuating the present unsatisfactory and uneconomical state of things by adding to the existing plant. In the meantime their company would be prepared to give a supplementary supply.

In re-examination, MR. HAMMOND said that the great difficulty that electric light companies had in competing with gas, was that electricity was much dearer.

MR. J. H. RIDER, electrical engineer to the L.C.C., in reply to MR. TALBOT, said he had examined the estimates of capital expenditure which had been put in by the promoters, and speaking as an engineer, he thought they were sufficient. The present scheme proceeded practically on the same lines as that of the L.C.C. Bill of last year, for the details of which he (witness) shared the responsibility. Such a scheme, in his opinion, would be of great advantage to existing distributors and to the public generally. The linking-up of existing stations would not afford a solution of the problem—such a scheme was not commercially practicable.

Replying to MR. BALFOUR BROWNE, WITNESS admitted that the L.C.C. scheme of 1906 provided for two stations. He was, however, of opinion that the one station at Barking proposed under the present Bill was sufficient. It was following out the Bill of the L.C.C. last year.

SIR HUGH BELL, one of the promoters, gave evidence in support of the financial proposals in the Bill. He said that for years he had interested himself in the problem of obtaining an economical and efficient supply of electricity to London, and he believed that the scheme now before the Committee offered a solution. By the sliding scale consumers had the means of obtaining power at a cheap rate, and he believed that would have the effect of stimulating manufacturing industries in the area covered by the Bill. By the purchase clause the company would receive the market value of land and property if the undertaking were acquired compulsorily in 1961. Supposing they were bought out at an earlier period, they would receive compensation in respect of goodwill and profits. He was satisfied that the scheme was a sound and economical one, and was prepared, with others associated with him, to find £600,000, which he estimated would suffice for the first year's operations.

Replying to SIR R. LITTLER, K.C., SIR HUGH BELL said he would object to the City area being excluded from the Bill, as they looked forward to an extended use of electrical power in printing and other businesses.

By MR. BALFOUR BROWNE: If he did not think the scheme a practicable one he would not be there supporting it. He did not anticipate that there would be any difficulty in obtaining the required capital now that the Bill had been modified.

MR. VESEY KNOX pressed witness as to the other persons who had subscribed to the promotion besides those mentioned in the Bill.

SIR HUGH BELL declined to give the names, saying that he considered he had given all the information that was necessary to show that the capital would be forthcoming.

MR. VESEY KNOX asked the Committee to direct the witness to give the information, but the CHAIRMAN, after consulting with his colleagues, announced that the Committee were unanimously of opinion that it was not necessary for the witness to answer the question.

In re-examination, WITNESS said he could not accept a proviso that in the event of purchase the amount to be paid as compensation should not exceed the amount of the capital "properly expended." Those authorised distributors who were within the proposed area of supply, and who were not opposing the Bill, he looked upon as likely customers, and he hoped that if they got their powers those who were now opposing them would see that it would be to their interests to take a bulk supply from them.

MONDAY, NOVEMBER 2ND.

MR. J. F. S. GODDAY, the general manager of the Great Eastern Railway, gave evidence in support of the scheme. In order that the companies might take a supply, he said current should be cheap and reliable. The present interchanging of the traffic required that the electrification should be on the same principle. The engineer to the East London Railway had been authorised by his company to consider the question of electrification of that line. The proposals of the present Bill could do them no harm, and it might be of benefit to them.

Cross-examined by MR BALFOUR BROWNE: His company had not considered the expediency of taking electricity from any particular undertaking. He did not think that the North Metropolitan Co.'s works were extensive enough to supply them.

MR. A. L. STRIDE, chairman and director of the London, Tilbury and Southend Railway, said that they worked 5½ miles of their lines by electricity. In 1904 they made considerable efforts to acquire electricity from various local authorities and companies, but those negotiations failed, as they could not obtain a supply from any undertaking, owing to legal objections that no supply could be given outside company's own area. They ultimately decided to take a supply from the District Railway Co.'s station at Lot's Road. He was in favour of the promoters' proposals.

By MR. BALFOUR BROWNE: He was not aware that the companies had a Bill which had passed the Lords' Committee for removing the restrictions of a company from being able to supply for consumption outside their own area.

In answer to MR. VESEY KNOX, WITNESS said the company took their supply on a sliding scale—the more current they took the cheaper they got it.

Re-examined: Under an Act of 1902 they had power to electrify the whole of their line.

Replying to the CHAIRMAN, WITNESS said that the agreement with the District Railway was for two years. They were now considering the renewing of that agreement, but whether for five or seven years they had not yet decided

MR. V. RAVEN, chief assistant and mechanical engineer to the North-Eastern Railway, said that company was taking its supply from the Newcastle Electric Supply Co. He thought they were taking a supply from that company as it was much cheaper than erecting their own station.

In answer to the CHAIRMAN, MR. RAVEN said that the company had two stations.

MR. W. B. WOODHOUSE, chief engineer to the Yorkshire Electric Power Co., said that it was on Mr. Parshall's report that the company issued their prospectus, and they commenced to supply in September, 1904. They could supply authorised undertakers, canals, and railways. They had made contracts for 9,000 H.P., and they gave a supply to eight authorised undertakers under provisional orders. The farthest distance they carried current was 18 miles, and that was at a pressure of 11,000 volts. In his opinion there ought to be some provision against a local authority unreasonably withholding its consent to allow a company to come in and supply. It was a great disadvantage to the power users, as they could not get the current cheaply, as would otherwise be the case. Their works cost was below ·2d., and they expected as the demand increased to bring that down to ·13d.

Cross examined by MR. BALFOUR BROWNE, although there was in their area 2,000,000 H.P., after three years' working they only supplied a little over 8,000 H.P. A certain portion of the revenue was derived from supplying apparatus and working it for the consumers. The price of their coal last year was 7s. 10d. per ton. They were supplying direct to three local authorities.

In answer to MR. RIGG, K.C., WITNESS said he had no grievance against the clause in the Yorkshire Power Bill which restricted them from taking mains through certain streets in Leeds and Bradford.

Re-examined: WITNESS said that large power users had asked for a supply, but it could not be given owing to the veto possessed by the local authorities.

The CHAIRMAN: Do you expect to get into Leeds?

WITNESS said he hoped that in course of time pressure would be brought to bear on the local authority to charge a reasonable rate or let the company in. They charged the same price wherever the consumer might be. They were prepared to give a supply at £4 per KW. of maximum demand. The average price all round was below ¾d. At the present time there was no actual scale of charge.

MR. TOM, engineer to the London Central Market Cold Storage Co., said that at one time they had their own generating plant at Smithfield, but they came to the conclusion that it would be more advantageous to take a supply from some other undertaking. They now had electricity from the Poplar Borough Council and the Smithfield Co., and their bill was something like £4,500 a year. If this measure passed they would be able to get their supply at about ½d. per unit as against their present average of just over 1d. per unit.

Replying to MR. BALFOUR BROWNE, WITNESS said be was not aware that the Smithfield Co. was not an authorised distributor. It was possible that he would have to get his supply through that company.

MR. FITZGERALD, in re-examining witness, explained that although the Smithfield Co. were not an authorised distributor, they could take energy as "persons having a supply."

MR. SUTTON, managing director of Henley's Telegraph Works Co., said that undoubtedly they would be able to get a cheaper supply from a larger company than a small one. At present they could not get a supply from the Woolwich Borough Council, as they were on the south of the Thames and his works were on the north. Assuming that they could get a supply at the estimates in the Bill, he would scrap his own undertaking. They had a gas plant at their works at Gravesend. Speaking from his knowledge of cables, he did not anticipate any danger from the fact of the transmission of energy at 15,000 volts.

By MR. MORTON: He was not aware that the cables of the West Ham Corporation came within a few hundred yards of his works.

MR. CONRARDI, superintendent of Messrs. Vickers, Sons & Maxim, said they had their own installation for the supply of electricity. They generated one and a half to two million units per annum. They also took a supply from the Erith Council. If they could take their supply from the Erith Council at prices estimated in the Bill, it would mean a considerable saving to them. It was a scandalous thing that London could not get electricity at a cheaper price.

MR. T. O. CALLENDER, managing director of Callender's Cable and Construction Co., and director of several other electrical companies, said they generated electricity themselves, and they also got a supply from the Erith Council at 1½d. per unit. He was absolutely convinced that in order to get cheap power it was necessary to generate on a large scale and at a station which supplied a large number of different industries, so as to get the full advantage

of the diversity factor. That could only be over a large and varied area. He had no doubt as to the reliability of the cables carrying 15,000 volts.

In answer to Mr. Balfour Browne: He had not been consulted by the promoters, and he had no financial interest in the scheme.

(To be continued.)

London Electric Supply Bill.—The second reading of this Bill was taken on Monday last; Mr. Morton, on behalf of the City Corporation, objected to the grant of powers which would enable the two companies competing in the City to amalgamate. After the second reading, Mr. Churchill moved an instruction to the Committee to insert a provision constituting the L.C.C. the purchasing authority, so as to avoid the complications which would otherwise ensue from the purchase of portions of the various undertakings by the different authorities at present empowered to purchase. Thus in 1931 the L.C.C. would acquire the linked-up system of the whole of the 13 companies, and if the borough undertakings were similarly linked up, the Council would be possessed of the whole of both systems at that date. A proposed instruction that the companies should not be entitled to any additional sum, in the event of the purchase, by reason of the exercise of the powers by this Act, or for any compensation for loss by severance, was opposed by the Board of Trade, and withdrawn. The Committee was authorised to insert provisions that would ensure that the linking-up powers conferred upon the companies should also be conferred on local authorities who were authorised distributors.

London (Westminster and Kensington) Electric Supply Companies' Bill.—This Bill was read a second time on Monday, and instructions to the Committee were agreed to similar to those reported above.

Victoria Falls Power Co.—In the House of Commons last week, Mr. Dundas White asked the Under-Secretary for the Colonies what was the nature of the title of the Victoria Falls Power Co., Ltd., to the Victoria Falls on the Zambesi and the adjoining land; whether it was freehold or leasehold, or what was the nature of the tenure; when it was granted; how much land it included; whether it gave the monopoly of using the Falls for power purposes or for the transmission of power to a distance; and what was the price paid by the company, and to whom was it paid.

Colonel Seely, in reply, said that his predecessor, on May 14th, 1907, gave certain particulars as to an indenture and agreement providing for the lease of the Victoria Falls by the British South Africa Co. to the African Concessions Syndicate, Ltd. In that agreement power was taken to assign any or all of the rights and benefits accruing under it to the Victoria Falls Power Co., Ltd. The Secretary of State understood that such assignment had been made. Further inquiry was being made into the matter.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Branches v. Agencies.

I have read with, I hope, great profit to myself, the admirable article by your correspondent "Vilex," which appeared in your impression of October 23rd.

May I be allowed to point out the rather obvious fact that, so zealous an advocate of agencies is "Vilex," he has omitted to consider the following proposition. A branch is generally established by any manufacturing concern with any pretence to the title of a serious undertaking, with the idea that it will have a sufficiently good load factor to balance its standing charges. It will occur to him now, for no doubt his mind has resumed its ordinary equable condition, that no undertaking is initiated with the idea that at any time during its career it should yield little or no profit. In truth, that is the sole reason for the existence of a branch, and the cause that renders a branch infinitely more efficient than any agency, no matter how well equipped. The agent can afford to neglect his principal's interests, provided he, the agent, has sufficient irons in the fire, while if a branch (an integral part of the business house) devotes the whole of its attention to the furtherance of the common interest it will manage to demonstrate the truth that there is always sufficient business to be obtained to justify its existence.

Ramifex.

Metallic-Filament Lamps.

With reference to Mr. Alderton's letter on metallic-filament lamps in your issue of October 23rd, I can only conclude that this gentleman's statements are the result of ignorance, as I presume he writes in good faith. His reference to the printed circular instructing purchasers of "Tantalum" lamps that they are to sell these lamps at a certain price, is a very cheap sneer at a most successful effort to uphold list prices and ensure legitimate profit to the trade.

It is hardly necessary to state that defective "Tantalum" lamps are always replaced when they are returned to the makers. I have never found them either unjust or ungenerous in their treatment of returned "Tantalum" lamps.

Justice.

October 28th, 1908.

"W. M. E." brings to view the deadliest aspect of the tungsten lamp trade in the opening part of his letter of the 16th. Perhaps the works manager, who some weeks ago volunteered some remarks, will again oblige the retailer with particulars of the system his works have for replacing bad lamps to their customers, and how they decide how many of any batch returned are electrically bad.

Anxious Enquirer.

I have read with interest the letter from Mr. Alderton in your issue of October 23rd, and speaking from a considerable experience after handling some thousands of tungsten lamps—practically all of the "Osram" type—I can unhesitatingly say that the makers' methods of dealing with breakages in transit and premature failures are all that can be desired.

Their sound delivery guarantee, which is very clearly stated in their catalogue, is always fully acted up to; in fact, I know of many instances where they have exceeded their obligations in the way of crediting lamps which have been returned to them not in accordance with the terms and conditions of sale. As regards premature failures, their treatment has been equally liberal, and I have never had a case of a genuine premature failure or blackening being refused credit.

Cases of pure mechanical breakages of the filaments, not being caused by any electrical defect, certainly are not credited, but the makers do not profess to change these, and to do so would only be a mistake, as it would put a premium on careless handling.

With regard to Mr. Alderton's concluding remarks *re* retail prices of the lamps, his meaning is somewhat obscure, and if he does not approve of the policy of maintaining a fixed price to the consumers, then I am much surprised, as I believe this policy has the heartiest approval and support of almost the whole of the electrical trade; it certainly has mine.

Stanley Johnston.

Belfast, *November 2nd*, 1908.

British Trade.

I have read with much interest the excellent leading article in your journal, dated August 28th, on British trade with Russia.

Your suggestions are admirable, as to business travellers obtaining a knowledge of the language spoken in the country to which their campaign leads them. With suitable men and determined support from home, such representatives would return most encouraging business, warranting the expense in preliminary training.

One reads so continually of dullness of trade, severe competition, and running works at little above cost, that I watch with impatience for a move from the home manufacturers to change the situation.

Surely such a grievance warrants a remedy, and it is "up" to British manufacturers to more systematically organise foreign business, and divert orders secured by other nations with qualified men on the spot.

If not unduly trespassing on your space, may I remark that the new Patent Laws appeal most strongly out here; and it is confidently hoped that at no distant date still fairer

competition with other countries will be possible, by the aid of protection in a modified form.

As regards export, British traders abroad should be more qualified than those at home to judge the merits or otherwise of protection, and opinion is unanimously in its favour.

Percival H. Nye.

Hong Kong, *October 3rd*, 1908.

Auto-Transformers.

From the editorial comment at the foot of my letter in your last issue, I am afraid I did not make myself clear.

I referred to the report that some supply undertakings had in contemplation a revision of their tariffs—the cause being attributed to metal lamps and decreased revenue. In your issue of June 5th (pages 966-7) the raising of the price to users of such lamps would appear quite legal, hence it seems to me there is nothing to be gained by incurring the expense of auto-transformers, &c. (in order to get the required C.P. metal lamps), if the rate charged for the supply is subsequently adjusted to give a return equivalent to that now obtained, unless the price is increased all round.

Cityite.

[To discriminate in this way between users of high-efficiency lamps and users of other types may, or may not, be legal, as stated in the article referred to; we are sure, however, that it would be a dangerous and possibly disastrous proceeding. The wire lamps are, in our opinion, destined to be the salvation of the lighting side of the electricity supply business.—Eds. E.R.]

INTERNATIONAL ELECTROTECHNICAL COMMISSION.

The Council of the above Commission, to which we have several times referred in our columns, concluded its sittings on Thursday, October 23rd. It is the opinion of all who took part in the deliberations that the results of these meetings were eminently satisfactory, and that the courtesy and forbearance which characterised all the discussions give every hope for the future success of the labours of the Commission.

No actual decisions were arrived at, but, on the other hand, the principles upon which the work is to be carried out were debated at length, and agreed upon, and recommendations were drawn up for the guidance of the several Electrotechnical Committees.

The meetings were really divided into three parts. At the opening meeting of the Council, the Right Hon. A. J. Balfour, M.P., delivered his address of welcome, which was suitably acknowledged by M. Paul Boucherot, the President of the French Society of Electricians, and Dr. E. Budde, the President of the German Electrotechnical Committee. Col. Crompton read his long and interesting report on progress, showing ten Committees actually in proper working order, six to be formed shortly, and six countries in which the question of giving their adhesion to the work of the Commission was being discussed. Prof. Elihu Thomson was unanimously elected as President of the Commission to succeed Lord Kelvin, reference being at the same time made to the profound regret felt by one and all that they were not able to welcome such an eminent man as the late M. E. Mascart as their new President. Col. Crompton was re-elected honorary secretary, and Mr. C. le Maistre was formally appointed secretary to the Commission. A special vote, proposed by the French delegates, was agreed to unanimously, to the effect that the thanks of the Commission be tendered to the Council of the British Institution of Electrical Engineers for their generous gift to the Commission, and also for the loan which had gone so far to assist the preliminary organisation. The Council then resolved itself into a Sous-Commission, and the meetings, which were presided over partly by Sir John Gavey, C.B., and partly by Prof. S. P. Thompson, discussed at great length the different matters brought forward for their consideration. These may be divided as follows:—Nomenclature, Symbols, Modifications to Rules, Standard of Light, Metric System, Proposal from the Electrical Congress of Marseilles, date and place of meeting of full Commission.

The question of the system on which the nomenclature should be drawn up was a most difficult one to decide, and the matter was not made less so because of the proposition put forward by the German delegates. As Col. Crompton explained at the commencement of the debate, the propositions now put forward for discussion by the Central Office were the outcome of certain proposals which had been circulated about a year ago, and which had been ably criticised by the German Committee. It was on account of these criticisms that the proposals had been re-arranged and were now put forward in their present form. A long debate ensued as to the advisability of adopting Dr. Budde's proposal, or rather amendment, that the Commission should seek the aid of the editors of a well-known electrotechnical dictionary; the final result, however, was that in view of the general opinion of the members being contrary to Dr. Budde's proposal, he with the utmost courtesy very kindly withdrew his amendment, and the suggestions of the Central Office were then taken one by one. The matter now stands as follows:—Each Committee is to draw up an electrotechnical glossary of terms with their explanations in the alphabetical order of the Committee's own language. These terms, with the explanations only translated into the official languages of the Commission, English and French, are to be forwarded to the Central Office when the list has reached the letter E. The lists from the different Committees will be circulated, and this procedure will be followed for the next five letters of the alphabet, and so on.

Due credit is to be given to those who have already worked on these lines, when making use of their work, which each Committee is advised to do when necessary. The alphabetical order of terms, irrespective of language, is to be adopted; the synonyms, *i.e.*, the terms themselves, will be given in the languages of the Committees which take part in the work of the Commission, whereas the explanations will be in French and English only. Each Electrotechnical Committee, if it so desire, may add its own language to those of the Commission, and publish this in its own country. Perhaps the chief point brought out in this discussion was the fact that the Commission does not intend to attempt the colossal task of editing a dictionary, but that of recommending that certain terms with their explanations be adopted internationally as being of real utility for the avoidance of the present ambiguity of expression.

The subject of symbols was approached with much diffidence, on account of its complexity, yet so cordial and animated was the discussion, that here also we have great hope of seeing good progress made towards universal agreement upon at least a few symbols. Prof. Silvanus Thompson, who occupied the chair at this meeting, suggested the advisability of endeavouring to formulate general principles only to start with. He drew attention to the Electrotechnical Congress at Frankfort in 1891, where a resolution had been passed expressing the wish that Greek characters should be employed only for expressing angles and angular quantities, or specific quantities and specific constants such as permeability. This was, in his opinion, a principle governing, and wisely governing, Greek characters to which he had tried always to conform. Unfortunately the late M. Hospitalier had broken down this admirable rule, as he had suggested at Chicago the use of the Greek letter θ for magnetic flux, which was neither specific nor angular. He agreed with M. Boucherot, the French delegate, as to the difficulty of arriving at anything like an international system, but yet he felt certain of the possibility of obtaining international agreement on general principles, which, although possibly of small moment in themselves, would yet be capable of a very extensive application.

He even thought it might be possible to obtain international agreement upon a few fundamental letters in common use in the electrical industry. If agreement could be arrived at as to the expression of Ohm's law, then the Commission would, indeed, have accomplished a most important and useful work. Speaking personally, he would be prepared to give up something if those in other nations would do likewise, and in this way, by compromise, a common agreement

might be arrived at. For instance, the letter "C" for current, the number of amperes, has been generally used in England, and was in general use in America until Hospitalier suggested the use of the letter "I." The American Institute now employs "I," but the N.E.L.A. of America still uses "C." Throughout the Continent "I" has been employed. The curious difference in language is, to a large extent, responsible for this, for whereas in English we speak of the strength or the amount of a current in amperes, in French they speak of the intensity of a current, and to us English the word "intensity" has an entirely different signification. Formerly, our telegraph engineers spoke about the current having two qualities, a "quantity" and an "intensity," meaning by the quantity of the current what we now call the number of amperes, and by the intensity of the current, the number of volts which propel that current. So in England the word "intensity" was employed to mean "voltage," and the word "intensity" has never been used to denote the magnitude or strength of the current or the number of amperes. To the English mind, therefore, to be compelled to use the letter "I" would mean the employment of an incorrect nomenclature and an incorrect order of ideas. Dr. Thompson reminded the delegates that Dr. Ohm in the year 1827, in his pamphlet on the laws of the electric circuit, did not use the letters employed to denote his law to-day. Ohm's law in its original expression was written $s = \frac{A}{L}$, s being the strength of the current, A the electromotive force and L the reduced circuit; there need, therefore, be no *amour propre* in standing up for our own way of writing it, seeing that it is not written in its original form as presented to the world by Dr. Ohm himself. Prof. Thompson thought there would be very little difficulty in arriving at international agreement in regard to the letter to be adopted for the electromotive force, but there was great divergence of opinion with regard to the letter to be used for resistance, and although he was accustomed to use the letter "R" in agreement with France and America, yet he would suggest for their consideration the possibility of changing and using "W" for resistance as used by the Germans if on their side the Germans would consent to employ "C" for current. This was a compromise which, in his opinion, was worthy of very careful consideration, and he put this forward in the hope of setting to work the thoughts of the different committees in the spirit of being willing to yield to each other in order to arrive at some general agreement. A discussion took place after the chairman's remarks, and it was decided that information should be gathered from all sources by the Central Office, with a view of formulating some suggestions at a later date, in a manner similar to that in which the suggestions regarding nomenclature had been arrived at. The modifications to the Rules proposed at the Preliminary Conference were carefully discussed and resulted in the acceptance by the French delegates of a modification in the method of arriving at the findings of the Commission, but different to their original amendment. The rule dealing with this matter, which can only be altered by a unanimous vote, now stands as follows:—"Each country shall be entitled to one vote only, either by person, by proxy, or by correspondence, whatever number of delegates it may appoint. Only such decisions may be published as those of the International Electrotechnical Commission which have been passed by a majority of at least four-fifths of the votes registered."

The proposal of the French Committee with reference to a provisional standard of light was adjourned, to allow the different Committees to gather further information, and to bring more into line the different interests affected. The question of the effect of the metric system on the work of the Commission was briefly referred to by Col. Crompton, who suggested that while the Commission should adopt the metric system for linear measurements, those countries which did not employ this system should be permitted to add in brackets the equivalent values.

The proposal from the Marseilles Electrical Congress was explained by Mr. Mailloux, who had acted as president to the Section dealing with the question of wiring rules. He said that he had nominated a *sous-comité* to deal with the matter, but had not been instrumental in the actual drafting of the resolution, which he thought went too far. If, however, the Commission could disseminate useful knowledge in the matter of wiring rules to those countries which had not that knowledge, then the Commission would be exercising one of its most useful functions.

A short discussion took place, and the sous-Commission agreed that the matter of wiring rules, although coming within the purview of the Commission, was one which could not be usefully dealt with at present on account of the numerous other matters of greater importance which had to be undertaken. This concluded the detailed work of the sous-Commission, which, embodied in a short report, was presented to the full meeting of the Council on Thursday, the 22nd ult. The report was adopted unanimously, and it was mentioned that the German Committee would welcome the Commission in Berlin in 1910, if a meeting at that date were thought advisable. A few matters of internal organisation were discussed, and, after the usual votes of thanks had been passed, including one to Mr. C. O. Mailloux for his assistance as interpreter, without which the debates would have been much retarded, the Council adjourned.

LEGAL.

Fletcher *v.* Nottidge.

In the King's Bench Division on Thursday last week, an action was brought before Mr. Justice Bucknill by Mr. Bernard Fletcher, a civil and electrical engineer, against Mr. Thomas Nottidge, of Ashford, Mr. Henry Curteis Burra, of Rye, Mrs. Rose Pomfret Pomfret, of Mystole, Canterbury, and Mr. Frederick Willoughby Ranken Hose, of 52, Lincoln's Inn Fields, as the trustees under the will of the late Mr. Wm. Pomfret Pomfret, to recover the sum of £315, professional fees and expenses alleged to be due in connection with the installation of the electric light at Mystole Mansion, and a scheme for the supply of water there. The defendants admitted that the plaintiff was consulted and prepared a report, but they alleged that he did so knowing that it would be necessary to obtain the sanction of the Courts to the expenditure of the money and agreeing to abide by any limitations imposed. The Courts, they pleaded, limited the total expenditure to £1,113 2s. 7d., and made an order authorising no greater payment to plaintiff than 5 per cent. on that amount, or £55 13s. in actual figures. Plaintiff had already received £205; £105 was paid in pursuance of a verbal agreement, but not on general account, and defendants counterclaimed for the repayment of £100 and damages which they alleged they had sustained in consequence of plaintiff's failure to prove or complete an affidavit to support their second application to the Court for authority to incur the necessary expenditure to install the electric light.

Mr. Sanderson, K.C., and Mr. Ricketts appeared for the plaintiff, and Mr. Pollock, K.C., and Mr. Norman Craig represented the defendants.

The case, which involved the reading of an enormous amount of correspondence, is proceeding.

Eastern Extension, Australasian and China Telegraph Co., Ltd., *v.* The Australian Commonwealth.

This week's Australian mail brought details of the High Court judgment in the above case, this being telegraphed from Melbourne to Fremantle, the last Australian port of call. The company claimed against the Commonwealth, payment of some £605, a proportion of money said to be due from the latter for telegrams dispatched over the plaintiffs' cables, payable under agreements (1869 and 1889) with the Tasmanian Government, and other smaller amounts were claimed in addition. Under the earlier agreement, it was said, in order to reduce the charges for the transmission of telegrams between Victoria and Tasmania, if the amount received by the company did not reach £5,600, the Government of Tasmania was to pay the deficiency. In 1906 the Commonwealth Government purported to reduce to nothing, and abolish the cable rates in question, and the object of the action just ended was to test the validity of the Order in Council accomplishing the abolition. Delivering judgment, the Chief Justice explained that when, four years after the plaintiffs had laid down a second cable in 1885, a new agreement was entered into between the company and Tasmania, the plaintiffs' right to telegraphic communications between Victoria and Tasmania was extended for 20 years, during which period a subsidy of £4,200 was to continue. It was agreed that the Government should have power at any time to reduce the scale of charges for transmission. The company was to take the whole of the proportion of the moneys receivable by them from all sources in respect of such telegrams, referred to as the "message receipts," and if after any reduction those receipts did not amount to £5,600, the Government guaranteed to pay the difference in addition to the subsidy. Notwithstanding a reduction of the charges by the Com-

monwealth in 1902, the earnings of the cable still exceeded £5,600 a year. In December, 1906, an Order in Council was made abolishing the scale of charges for the transmission of telegrams between Tasmania and Victoria to places beyond the Commonwealth and the Pacific. The plaintiffs protested that the order was not a valid exercise of the power to reduce the scale of charges within the meaning of the agreement existing; but, subject to their legal rights, the company had not interrupted the course of business. The Chief Justice thought it a fallacious argument of the defence that the power to reduce might be exercised from time to time and to any extent, so as to bring the receipts down to a merely nominal sum, and that, consequently, the plaintiffs had not suffered any loss by the action of the Government. He held that the Order in Council of 1906 was not authorised by the power to reduce according to agreement, and was wholly inoperative. The result was that the Commonwealth was bound to account to the plaintiffs at the rates fixed in 1902 until they could be lawfully reduced, which had not yet been done. Plaintiffs were entitled to judgment for £491, about £142 having been paid. The Chief Justice found that they were also entitled to a declaration that the defendants were bound to account to them for all messages at the rates fixed in 1902, until those rates shall be lawfully reduced, and for all moneys payable to the plaintiffs in respect of all the Australasian traffic, and also to pay the plaintiffs at the rate of £50 per annum in respect of shipping intelligence until the agreement as to that matter is lawfully terminated.

Justice Sir Edmund Barton and Mr. Justice O'Connor delivered concurring judgments, but Mr. Justice Higgins dissented. There was, he said, no express qualification of the power to reduce the charges: therefore, the power to reduce was a power to reduce without limit, unless there was some limit necessarily implied. Apart from the use of the word "reduce," there was absolutely nothing to indicate that any scrap of the charges need be left. The Court had no right to add words to the agreement by conjecture. On the interpretation of the documents, his conclusion was that there was a power to reduce *ad infinitum*. The difference that remained was the difference between the vanishing point and nothing. It was said that the abolition of the cable rates would mean a great increase of business to the company and great expense, but so would any substantial reduction of the cable rates. His answer to the first question was that the Government had power to reduce the scale of charges to nothing.

Bock *v.* Dolter Electric Traction Co.

In the Chancery Division on Tuesday, November 3rd, before Mr. Justice Eve, Mr. Vernon moved in this case for judgment in default of defence in a debenture-holder's action. Plaintiff is a registered holder of 175 debentures of £100 each, issued on August 2nd, 1907, which had since become due. The company, said counsel, since the issuing of the statement of claim had gone into liquidation.

His Lordship made the usual order.

NEW PATENTS APPLIED FOR, 1908.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

22,044. "Improvements in arrangements for storing and distributing alternating currents of electricity." A. M. Taylor. October 19th.

22,083. "Improvements in electrical devices for the synchronisation of mechanical clocks." W. J. Polyblank. October 19th.

22,134. "Improvements in and relating to protective devices for electric distribution systems, of the type known as lightning arresters." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 19th.

22,135. "Improvements in and relating to protective devices for electric distribution systems, of the type known as lightning, arresters." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 19th.

22,159. "Improved method of and apparatus for compensating for variation of current due to variation of resistance arising from changes of temperature in windings such as field windings of dynamo-electric machinery, solenoids and the like." W. Stansfield and J. J. Hatt. October 20th.

22,168. "Improvements in trolley heads for overhead electric traction." F. Kompe. (Date applied for under Sec. 91 of the Act, October 22nd, 1907, being date of application in Germany.) October 20th. (Complete.)

22,179. "Improvements in electric telegraphy." I. Kitsee. October 20th. (Complete.)

22,192. "Antiseptic telephone swab or brush, and index locater." C. Tandy. October 20th.

22,210. "Circuit closer." R. D. Tiffany. October 20th. (Complete.)

22,215. "Improved method of and apparatus for indicating and locating faults in systems of conductors for high-tension electricity." C. Lukes. October 20th. (Complete.)

22,227. "Electric railway system." W. Robinson. October 20th. (Complete.)

22,228. "Improvements in starting switches for electric motors." E. Garside. October 20th.

22,236. "Improvements in electric batteries." L. P. Basset. (Date applied for under Sec. 91 of the Act, October 31st, 1907, being date of application in France.) October 20th. (Complete.)

22,263. "Improvements in or relating to electrical alarm clocks." D. H. Smith and L. A. Hearing. October 20th. (Complete.)

22,271. "Improvements in and relating to magneto-ignition systems and apparatus in or applicable to such systems." J. L. Milton. October 20th. (Complete.)

22,273. "Improvements in apparatus for generating alternating currents." E. G. Abrahams. October 21st.

22,282. "Electrical condenser whose capacity is varied by the impact of sound waves." F. J. Chambers. October 21st.

22,314. "Improvements in and relating to tramway conduit points." J. Murray. October 21st.

22,321. "Improvements in and relating to mechanical interrupters for use with induction coils and apparatus where it is desired to obtain a 'making' and 'breaking' of an electric current." H. F. Bigge and F. R. Butt. October 21st.

22,345. "Portable switch or key for electric flash signalling purposes." A. C. Davey. October 21st.

22,349. "Improvements in and relating to the speed regulation of electrically-driven ring spinning frames." Akt.-Ges. Brown, Boverie & Cie. (Date applied for under Sec. 91 of the Act, May 27th, 1908, being date of application in Germany.) October 21st. (Complete.)

22,377. "Improvements in and relating to electrical driving gear." G. F. O. Pollet. October 21st. (Complete.)

22,409. "Improvements in closed circuit signal installations." Siemens Bros. & Co., Ltd. (Siemens & Halske Aktien-Gesellschaft, Germany.) October 22nd. (Complete.)

22,410. "Improvements in fire alarm installations." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) October 22nd. (Complete.)

22,413. "Improvements in or connected with overhead gear for the propulsion of vehicles electrically." British Insulated and Helsby Cables, Ltd., and J. W. Astley. October 22nd.

22,426. "Improvements relating to the insulation of switches, current-breakers, automatic switches and the like." A. E. Peyrusson. (Date applied for under Sec. 91 of the Act, October 23rd, 1907, being date of application in France.) October 22nd. (Complete.)

22,436. "Improvements in thermo-piles." F. E. Beeton. October 22nd.

22,439. "Improvements in selective signalling devices." I. F. Manny and A. V. Binzel (trading as Manny Signal Co.). October 22nd. (Complete.)

22,450. "Improvements in the construction of field magnets for magneto-electric generators." A. Schanschieff. October 22nd. (Complete.)

22,454. "Improvements in and relating to electric arc lamps." S. C. Mount and Beck Flame Lamp, Ltd. October 22nd.

22,468. "Improvements in or connected with wireless telegraphy and telephony." J. Rymer-Jones. October 22nd.

22,500. "Improved method of and apparatus for controlling the voltage of dynamo-electric machines, especially applicable to variable-speed generators." W. Stansfield and J. J. Hatt. October 23rd.

22,516. "Improvements in incandescent vapour lamps." J. H. Mizss. (Date applied for under Rule 13, November 22nd, 1907. An invention comprised in appliction No. 25,884, dated November 22nd, 1907.) October 23rd.

22,551. "Improvements in or relating to electric cooking and heating apparatus." E. Coiseur. (Date applied for under Sec. 91 of the Act, March 27th, 1908, being date of application in France.) October 23rd. (Complete.)

22,562. "Improvements in or relating to electric distributing stations." Voigt and Haeffner Akt.-Ges. (Date applied for under Sec. 91 of the Act, November 1st, 1907, being date of application in Germany.) October 23rd. (Complete.)

22,598. "New or improved method of producing hot water by means of electricity and apparatus therefor." G. G. Bell and J. St. V. Pletts. October 24th.

22,621. "New or improved anti-vibration device for electric light pendants, gas pendants, and the like." A. Newall. October 24th.

22,627. "Improvements in electrical connections with rods of silundum or the like having comparatively poor conducting qualities." G. Cooper and F. Chester. October 24th.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1907.

Working of Rail Points and Plough Guides on Electric Tramways or Railways, and of Rail Points and Cable Grip Guides on Cable Tramways or Railways. W. J. Stewart. 5,560. March 7th. (Post-dated October 7th, 1907.)

Distribution of Electromotive Power. H. Chitty, F. M. Lange and G. W. Mascord. 17,719. August 2nd.

Central Alarm and Telephone Apparatus. B. Fett. 19,612. September 2nd

Dynamo-Electric Machines. British Thomson-Houston Co. and F. H. Clough. 19,882. September 5th.

Electric Switchboard Cable Connector. S. Rosenbaum. 21,861. October 3rd. (Date applied for under International Convention, October 3rd, 1906.)

Process of and means for Manufacturing Filaments for Illuminating and Heating Purposes. W. E. Lake. (G. Michaud and E. Delasson, France.) 22,036. October 5th.

Electro-Deposition of Iron. S. O. Cowper-Coles. 22,311. October 9th.

Manufacture of Iron Articles by Electro-Deposition. S. O. Cowper-Coles. 22,314. October 9th.

Composition Applicable for Use for the Purpose of Damping, Transmitting or Reproducing Mechanical Vibrations, and, if Desired, Translating them into Electrical Variations. H. S. Martin. 24,476. October 11th.

Anodes for Electro-Deposition. S. O. Cowper-Coles. 22,543. October 12th.

Galvanic Cells having Rotating Electrodes. A. S. von Eltenberg and H. Lach 21,807. November 2nd.

Regulation of Electric Induction Motors. A. Scherbius. 25,305. November 14th.

Electric Portable Photographic Lamps. O. T. Banks. 25,511. November 18th.

Electric Lamp Cluster Sockets. G. A. Harter. 25,831. November 21st. (Date applied for under International Convention, November 22nd, 1906.)

1908.

Collecting Rings for Dynamo-Electric Machines. British Thomson-Houston Co. (J. E. Noeggerath, United States.) 1,709. January 24th.

Dynamo-Electric Machines. Siemens Bros. Dynamo Works, Ltd., and M. Schenkel. 1,882. January 27th.

Single-Phase Commutator Motors. Siemens Bros. Dynamo Works, Ltd., and F. Lydall. 2,503. February 1st.

Electric Arc Lamp. L. S. Andersson. 3,464. February 15th. (Date applied for under International Convention, February 18th, 1907.)

Electric Railway Signalling System. Y. Burgess. 3,894. February 20th.

Electric Wall Plugs. T. S. Schneidau. 4,472. February 27th.

Electrically-Operated Horns and Trumpets. W. A. Ayles. 4,635. February 29th.